




The Tool **Engineer**

.....

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL  ENGINEERS

JUNE, 1952

VOLUME XXVIII, NO. 6

PLANNING
ENGINEERING
CONTROL

OF

TOOLING
EQUIPMENT
PRODUCTION

**Here's How Heald helps you get
permanent precision in
round-the-clock production**



A Heald technician checks the timing accuracy of the feed controls for a Heald internal grinding machine.

**Constant-feed hydraulic system
makes Heald machines
independent of changes in
temperature and oil viscosity**



*Heald machines speed
the nation's production*

• Now, when "the heat's on" for sustained high-speed production, you don't have to waste time adjusting feeds and speeds to compensate for changes in temperature and oil viscosity. For these variables are taken care of automatically in all new Heald production type internals and Bore-Matics.

A unique system of constant-feed throttling maintains pre-set feed rates throughout the longest production runs—regardless of normal changes in internal or surrounding temperature. Accuracy and precision remain constant—scrap losses are negligible.

That's just one of the many ways in which Heald machines help maintain peak production of precision-finished parts.

THE HEALD MACHINE COMPANY

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The Tool Engineer

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AMERICAN SOCIETY OF TOOL ENGINEERS

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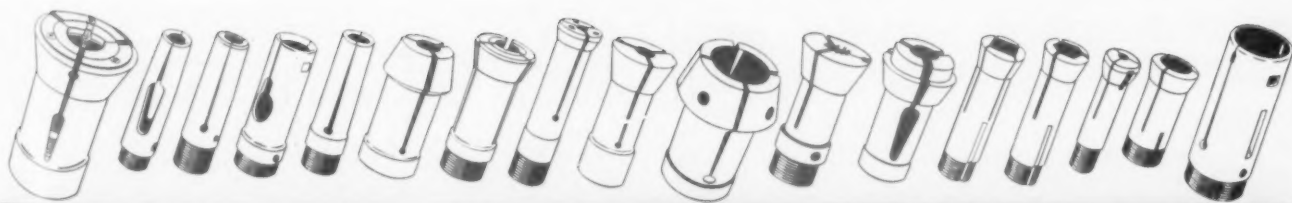
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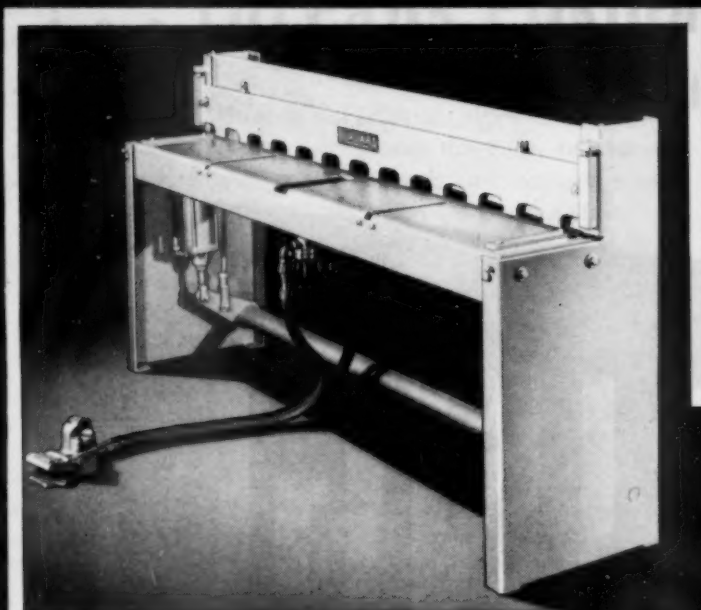
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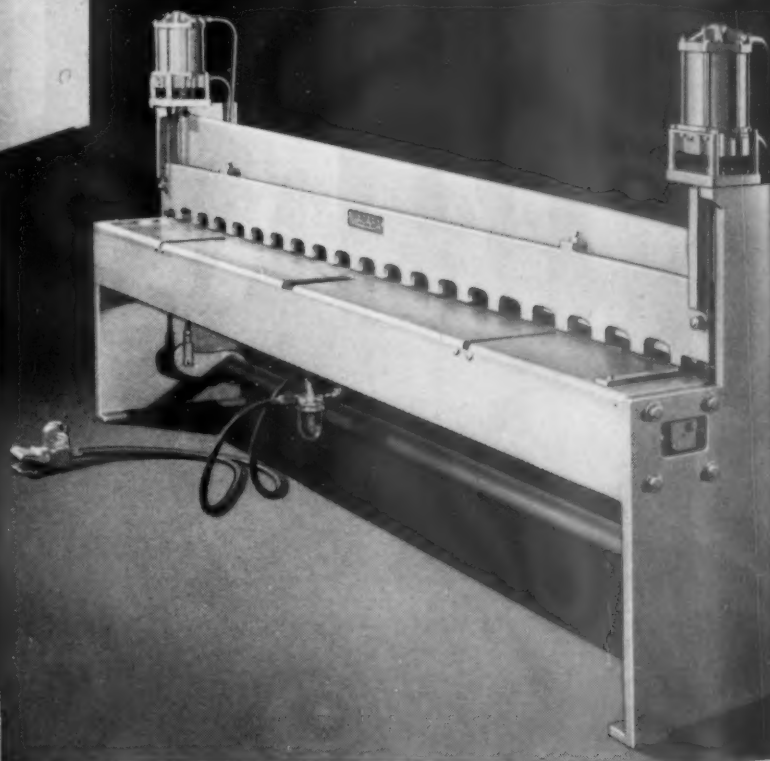
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Plug Gage with
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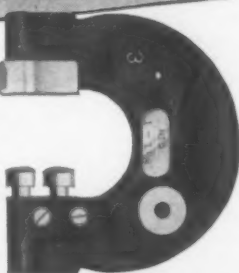
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Sizes and Models
for all
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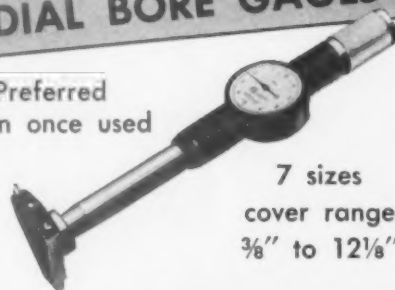
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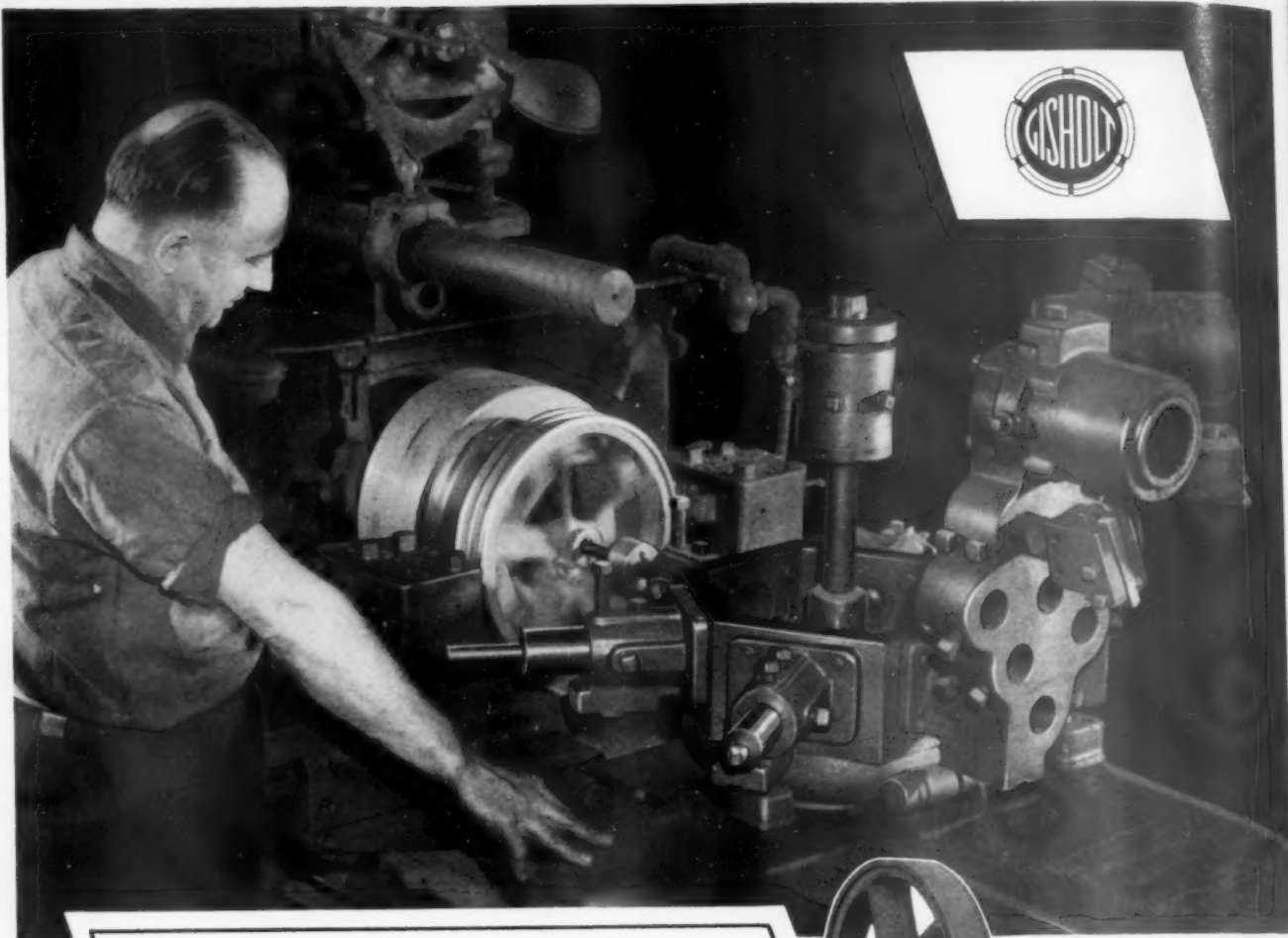


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Production Trebled by the ***FASTERMATIC!***

Note here the rather simple tooling arrangement for machining cast iron sheaves. This setup, similar to regular turret lathe work, is made just as easily. But here, the machine performs 15 different operations—holds tolerances consistently—completes the entire machining job in 13 minutes. The former time was 39 minutes.

Completely Automatic Cycle

It's the swift, automatic cycle of the FASTERMATIC that accounts for such substantial time savings. With its hydraulic feed system and automatic speed control, the operator has only to load the chuck, start the machine and remove the finished work. Usually, the operator has time to tend a second machine.

Now, when you need still greater production, it is a good time to look into the FASTERMATICS. Write for the FASTERMATIC catalog.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.



GISHOLT

MACHINE COMPANY

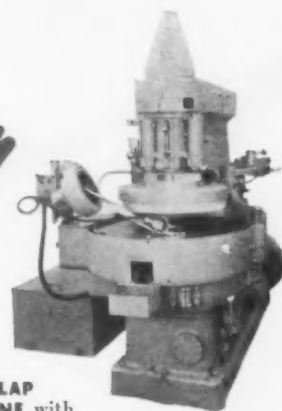
The FASTERMATICS are universal automatic turret lathes. Designed for accurate, high production turning, they can also be economically used on comparatively small lot work.

Madison 10, Wisconsin

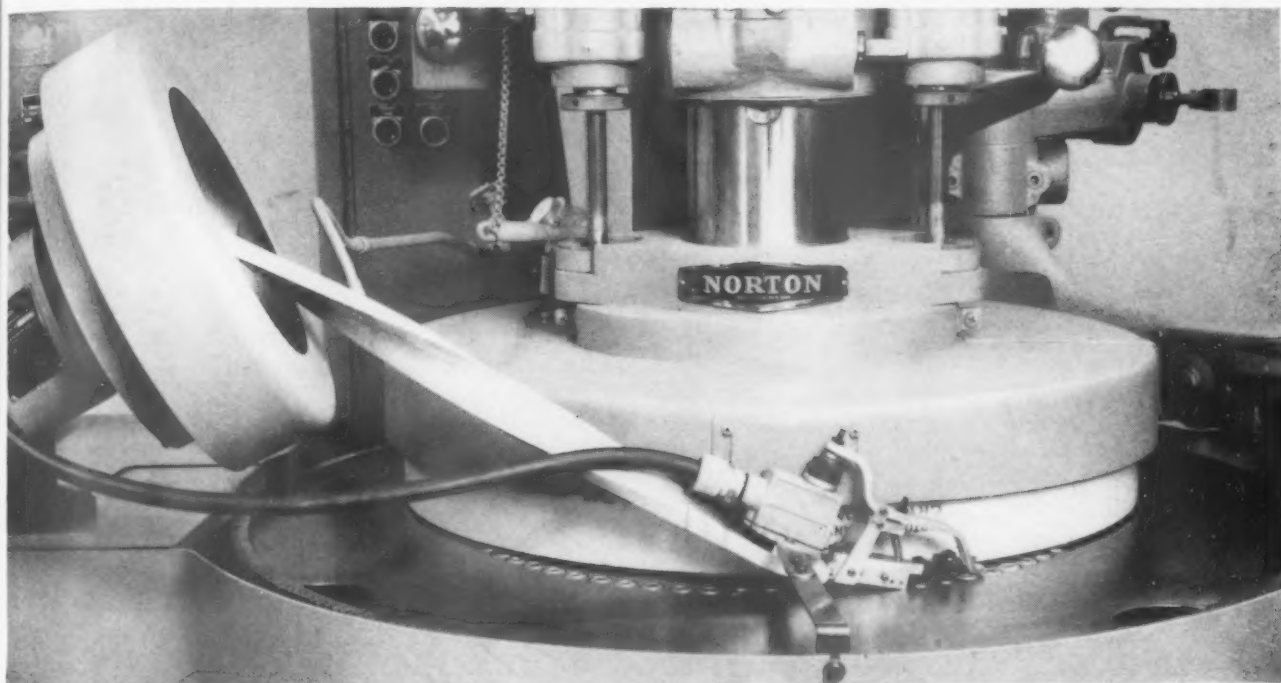
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Norton Thru-Feed Lapper

cuts costs of lapping small, flat parts



NORTON 26 HYPROLAP LAPPING MACHINE with automatic loading features that increase production of small, flat parts difficult to handle manually as much as 4 to 1 . . . as many as 8000 pcs/hr.



AUTOMATIC LOADING ARRANGEMENT of Norton 26 Hyprolap lapping machine makes sure parts are in correct position before entering feeding trough . . . prevents ganging up . . . directs work in a path that assures even lap wear.

NEW built-in automatic loading adds extra advantages to Norton 26 Hyprolap*

Do you want to make 4-to-1 savings in lapping small, flat parts? You can . . . as many firms report . . . with new Norton 26 Hyprolap lapping machines with the exclusive built-in thru-feed mechanism.

Here's why:

1. You speed up production. Loading and lapping operations handle parts as fast as 8,000 pieces per hour.

2. You cut handling. Loading and unloading are completely automatic.

3. You reduce downtime. Work path traverses the entire working surface of each lap . . . promoting even wear . . . reducing the frequency of lap dressing.

4. You cut out operations. This lapper removes stock down to .0002" tolerances . . . makes surfaces parallel to .000025" . . . in many instances without pre-grinding of parts.

5. You use less skilled help. Filling feed hoppers and removing finished-

work baskets are the only manual operations.

No wonder 4-to-1 savings are a matter of record with the new Norton Hyprolap with built-in automatic loading!

Send for Bulletin 852-7. Also submit samples of your work for production estimates. Standard hopper-feed Hyprolap machines take work up to 1 1/4" diameter. Modifications handle larger work. **NORTON COMPANY, Machine Division, Worcester 6, Mass.**

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Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

*Trade Mark Reg. U. S. Pat. Off.

*"Sure
we have it...
you know we
stock the whole
MORSE
Line"*

MORSE

The advertisement features a collection of Morse brand metalworking tools, including several twist drills of different sizes and two reamers, arranged diagonally across the page. The tools are dark and polished, with the brand name 'MORSE' clearly visible on their shafts. The background is a light, textured surface, and the overall composition is clean and professional.



And all Morse-Franchised Distributors' salesmen can say the same, to all customers. For they're backed up with fully maintained distributors' stocks of drills, reamers, taps, cutters, and end mills . . . *the full line of Morse Quality Products.*

That's the *only* way Morse Cutting Tools are sold . . . through Morse-Franchised Distributors.

And this gives *you* the full benefit of an unbeatable combination . . . Morse Quality Cutting Tools, supplied to you by top distributors who *know* Morse Tools, and how to put them to work to make money for *you*. See your Morse-Franchised Distributor *today*.

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... buy them by phone from
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AUTOMATIC TRANSFER

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AUTOMATIC SAFETY INTERLOCKING SYSTEM

SKILLED OPERATORS NOT NEEDED

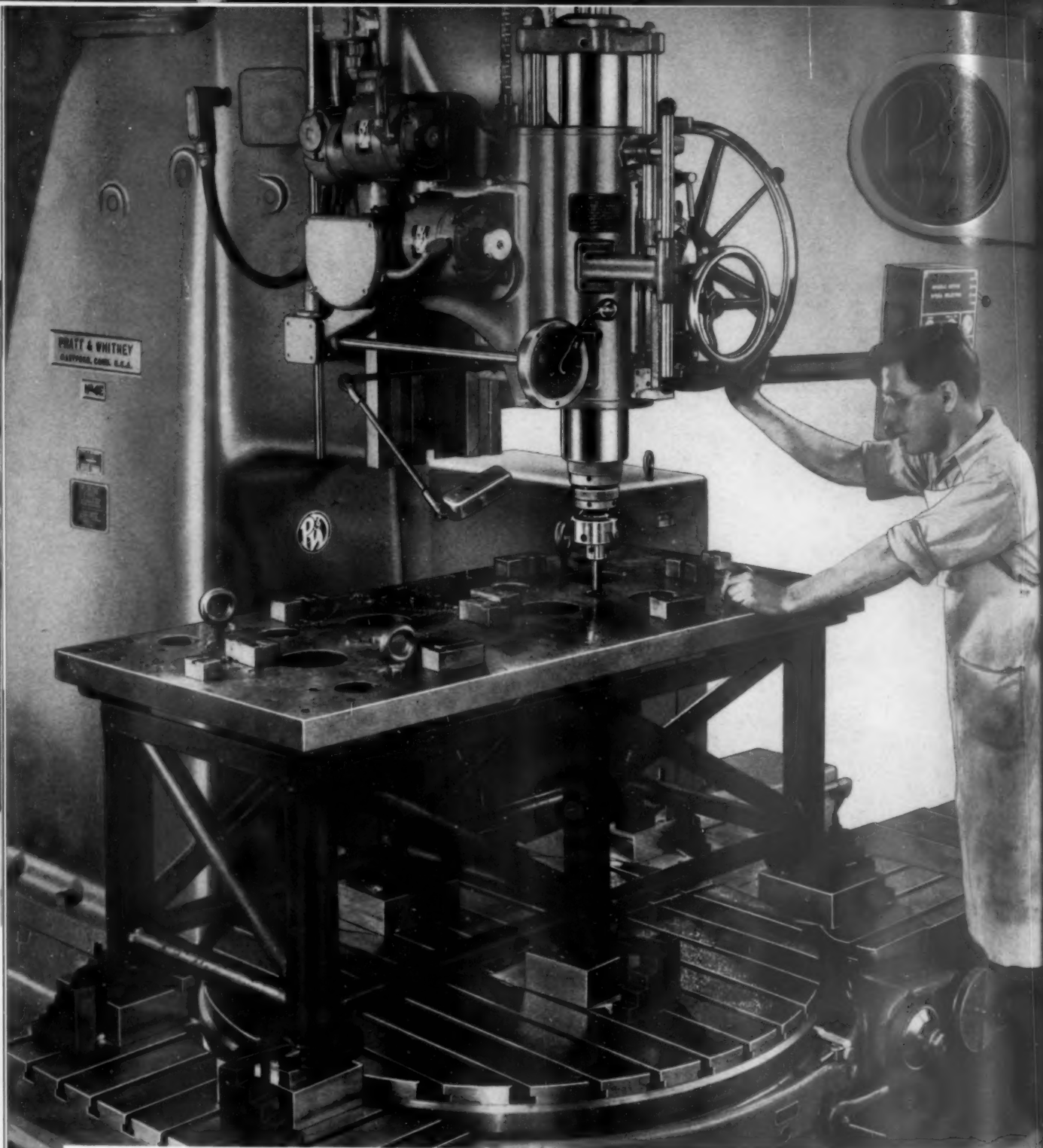
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TOOL & ENGINEERING COMPANY

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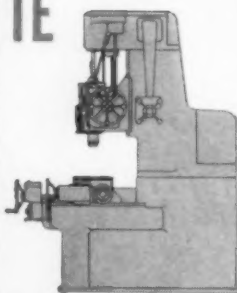
★
**DETROIT 7,
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26 Years of Successful Cooperation with Leading American Industries



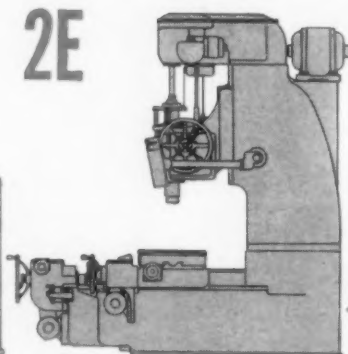
COMPLETE RANGE OF SIZES

1E



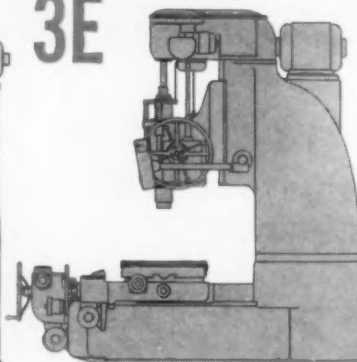
Made in two sizes: 12" x 24" table with 18" and 12" travels, and 12" x 42" table with 36" and 12" travels.

2E



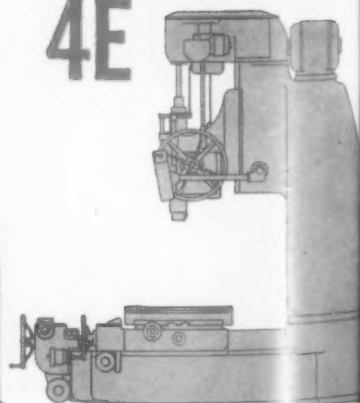
22" x 44" table with 36" and 22" travels.

3E



28" x 56" table with 48" and 28" travels.

4E



36" x 72" rectangular table or combination 48" rotary and rectangular table, with 60" and 36" travels.

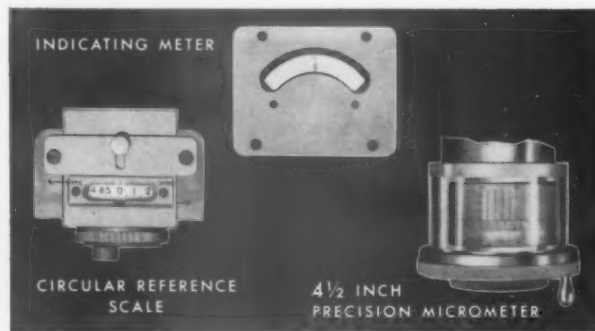
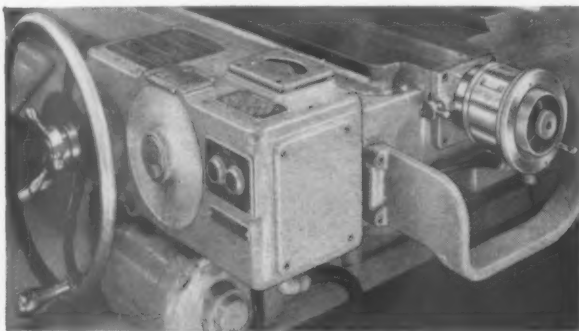
PRATT & WHITNEY

Electrolimit JIG BORERS

Pratt & Whitney Series "E" Jig Borers meet today's demand for fine accuracy, versatility, greater capacity and increased speed of operation. These machines are accurate and stay accurate. Locating, boring and checking to .0002" accuracy is accomplished positively, faster and with greater ease than ever before. P&W open-side construction accommodates larger work . . . provides maximum operator convenience . . . reduces "per-piece" cost. An outstanding feature is the **Ball Roll Quill Spindle**. Roll feeding on preloaded, super-precision ball bearings, this mounting maintains its accuracy and rigidity indefinitely without maintenance of any sort.

Each Series "E" Jig Borer is machined, hand scraped, assembled and inspected to meet the inflexibly high Pratt & Whitney standards that are your guarantee of the ultimate in lasting accuracy.

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This new method of locating the table is based on the time-proved principle of the Pratt & Whitney Electrolimit Precision Gage. It is fast and easy to use, extremely accurate and absolutely positive. Basic 1 inch spacings are obtained electromagnetically from a solid master bar. There are no contacting surfaces, no wear. Original accuracy is retained indefinitely. Fractional inches are provided by a high precision micrometer screw. Two completely independent measuring units control the longitudinal and transverse settings. Both are located at the operating position for greater operator convenience.

Shown above are the three "operating" units of the Electrolimit Measuring System:

Circular Reference Scale — for fast, approximate settings.

Indicating Meter — for the exact locating of zero readings (this scale is a visible assurance of tenths-of-a-thousandth accuracy at all times).

4 1/2" Precision Micrometer — for the easy reading of direct settings to .0001". Even finer estimated settings are possible.

For additional information, write on your company letterhead to your nearby Pratt & Whitney Branch Office listed below.

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First Choice  *for Accuracy*

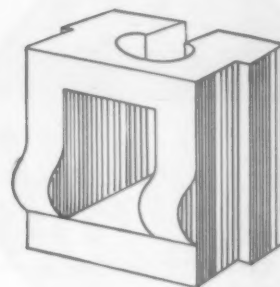
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You can't take a chance with a BREECH RING

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BROACHING eliminates the worry and the risk of spoilage, in machining this heavy Breech Ring . . . and does it with relatively unskilled men! Close tolerances and fine finish are automatically obtained with this LAPOINTE two-machine setup, which has proved to be so successful with Arsenals and sub-contractors on 90 mm guns. Production speed is impressive, too: **one completely broached part every 50 minutes!**



Send today for our special bulletin on horizontal broaching machines. Ask for HP-5.

50 YEARS IN BROACHING!

We're the oldest in the world!

1902 • GOLDEN ANNIVERSARY • 1952



LAPOINTE HP-100 HORIZONTAL BROACHING MACHINE 50 TON, 72-INCH STROKE. Hydraulically operated shuttle type fixture, with hydraulic clamping cylinders. Completely automatic hydraulically operated horizontal turrets eliminate all manual handling of the heavy broaches.

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BAND TOOLS

DoALL



GAGE BLOCKS



SURFACE GRINDERS

PRODUCTION NEWS

SANDS • GAGING EQUIPMENT • TOOL STEEL • CUTTING TOOLS • INDUSTRIAL SUPPLIES

Vol. 1

Published by The DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois

No. 5

DoALL Bench Filer Can Speed Up Die Making

No Hand Filing Required;
Speed is Infinitely Variable
from 170 to 470 Strokes per
Minute; File Can be
Aligned in 10 Seconds

Toolmakers who have used a DoALL Bench Filer usually name three primary reasons for its ability to turn out accurate work faster than it can be done by other methods:

1. The file can be set perfectly straight the machine in about 10 seconds;



2. The accuracy of the machine eliminates any need for touching up the piece with a hand file; and,

3. The speed range is infinitely variable (not stepped) so that the best speed for tool life and desired finish can be secured on any job.

A patented universal-joint file clamp compensates for any irregularities in the file shank. A file setting square is provided with the machine to line the file up perfectly before clamping it tightly in position. There is no wobble in the filing action, making possible perfect accuracy of cut.

The Bench Filer is equipped with a DoALL Speedmaster variable speed pulley, adjustable by hand crank to any desired tool stroke speed.

The machine also includes an easily adjustable tilting table, instantaneous vertical bearing adjustment, magnifying lens for easier view of close work (extra) and an air jet nozzle for blowing away filings from the point of work.

In addition to filing, the machine can be used for sawing and honing with a few accessory pieces.

The price is only \$215. Literature is available upon request.

Band Machine Gives this Monster Its Sharp Teeth for Big Bites

Hanna Coal Company Keeps Stripping Shovel in Digging Trim with Versatile DoALL MP-20

The cab is bigger than a house, the boom looks like the Eiffel Tower and you can almost lose a truck in the dipper of the big stripping shovel pictured here.

Keeping this machine on the job for its owner, Hanna Coal Company, is a major responsibility of a DoALL MP-20 Contour-matic Band Machine. When a dipper tooth base needs replacement, the MP-20 cuts a new one. When it strips a gear, the DoALL machine saws a new one out of alloy steel.



DoALL Hand Files Available Immediately To Meet Local Shortages

In order to help meet the current unbalance of hand file distribution throughout the country, DoALL is now making the most widely used types available immediately to any section of the country. Where local stocks prove temporarily inadequate, most orders can be promptly filled from DoALL central warehouse stocks. Delivery is free regardless of quantity ordered.

Seeing is Believing

Because it is not always possible for a buyer to evaluate the possibilities of a product without witnessing its performance, DoALL offers free demonstrations of any DoALL product at any plant. No obligation is entailed in requesting such a demonstration.



The Contour-matic machine is an all-around performer wherever a variety of sawing, slicing, grinding, filing, honing or polishing jobs must be done. It's speed range is 40 to 10,000 blade feet per minute. It will handle every DoALL band tool made for cutting every material. Its hydraulic controls make it easier to operate, and faster.

A free demonstration of the Contour-matic can be arranged at any plant requesting it.

NOW A COMPLETE SYSTEM FOR To Reduce Rejects and Waste

1. A Complete Text on "The Science of Precision Measurement"



HERE is a new 256 page textbook that contains complete information on the theory and use of Gage Blocks, Optical Flats, Monolites, Electric Comparator Gages and related equipment for dimensional measurement; explains the "reading" of millionths-of-an-inch measurement with light wave interference bands; shows why such accuracy is necessary to control thousandths of an inch production tolerances; tells recommended procedures for statistical sampling of parts for dimensional control, that will show you how to reduce rejects and waste. No other single publication treats these subjects in so comprehensive a manner. This \$3.50 book is a component part of the DoALL Dimensional Quality Control System and a guide to maximum benefit from use of Gaging Equipment. To secure a copy call your local DoALL Sales-Service Store or write direct.

2. An Outstanding Line of Precision Measuring Equipment

DoALL BLOCKS



There are 15 standard sets of DoALL BLOCKS from a 6-piece set for checking micrometers to a 118-piece Master Gage Set. No finer Gage Blocks are manufactured anywhere in the world. All are guaranteed to equal or surpass National Bureau of Standards recommendations for dimension, flatness, parallelism, finish and hardness. A complete line of accessories enables you to use DoALL BLOCKS for checking dimensions of any conceivable part, tool or gage. Ask for your free copy of "Modern Measurement Control"—24 page Catalog describing the features and uses of DoALL BLOCKS and accessories.

3. A Practical Service Program

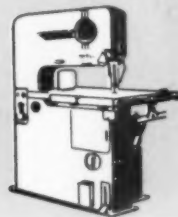
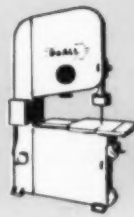
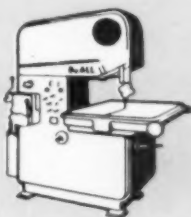


DEMONSTRATION — DoALL Service starts with a demonstration of DoALL Gaging Equipment right in your plant.

TRAINING MATERIALS — Explanatory texts and films available on the theory, use of and care of gaging equipment. DoALL Sales-Service men are at your service at all times for consultation and help.



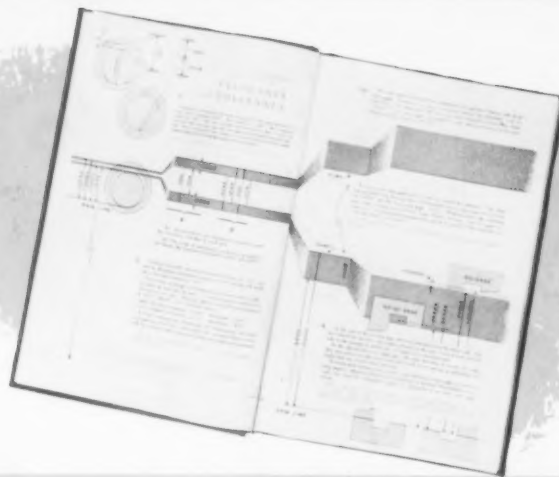
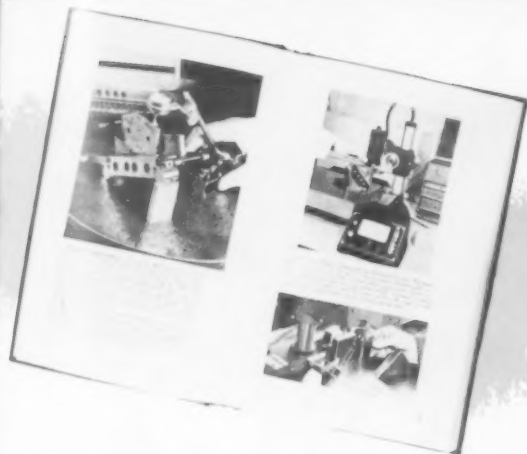
GB-7



DoALL PRODUCTION NEWS

DIMENSIONAL QUALITY CONTROL

Manhours, Metals and Money



DoALL MOBILE INSPECTION UNIT



A unique unit which permits on-the-spot inspection of working gages right at the machine—a system that saves man-hours, reduces faulty work, lengthens gage life, simplifies control and prevents mix up of gages from different points in the plant.



DoALL OPTICAL FLATS

Highest quality quartz, precision Optical Flats for "reading" millionths-of-an-inch with light wave interference bands. Both circular and square types available. Complete range of sizes up to 14-inch diameter.

DoALL MONOLITE



Another DoALL development in pioneering light wave measurement equipment—a new high intensity helium light source for inspecting dimensions or surfaces through Optical Flats for millionths-of-an-inch variation. Many improvements over previous model. Ask for bulletin.



Call your local DoALL Sales-Service Store or write

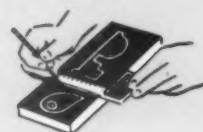
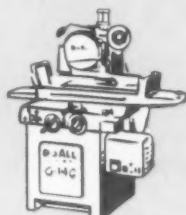
THE DoALL COMPANY

254 N. Laurel Ave., Des Plaines, Illinois

DoALL

35 Sales-Service Stores in Principal Cities

GAGE BLOCK CALIBRATION SERVICE—Just as you periodically check the finest watch against a master standard, so must you periodically check the accuracy of finest lineal measurement instruments — Gage Blocks — against the ultimate constant—a wavelength of light. DoALL offers this service at a nominal charge for any make of block. Ask for details.



MOBILE INSPECTION UNIT

TOOL STEEL

Accuracy of Saw Set a Critical Factor in Band Sawing Efficiency

DoALL Quality Control Program Insures Precision Set Tolerances

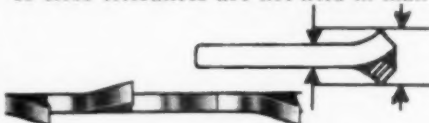
Set of saw teeth is defined as: "the amount of displacement or offset given each tooth to create side clearance for



Checking DoALL saw set tolerance with an optical comparator.

the back of the saw band when cutting through a material." In manufacturing DoALL saw bands, set is held uniform to a tolerance of plus or minus .0015",

with symmetry of set held within .0005". If close tolerances are not held in man-



Set is the amount of bend given the teeth to provide clearance for the back of the saw band.

ufacturing saw bands one or more of the following difficulties can arise:

1. Unsatisfactory finish.
2. Failure of band to cut as sharp a radius as that for which it is designed.
3. Tendency of band to lead right or left, spoiling straight cuts.
4. Binding of band in cut.
5. Dimensional inaccuracy of kerf in slotting applications.
6. Excessive heat generation.
7. Failure to cut at maximum rate.

Among the 83 separate inspections of DoALL Saw Bands during manufacture, several are devoted exclusively to checking the accuracy of saw set. Any variation, no matter how minor, from DoALL's exacting set tolerances is cause for a band to be rejected. Such quality control standards assure the DoALL saw band user of maximum sawing efficiency and permit the DoALL guarantee of "complete satisfaction as to quality or replacement at no cost".

DoALL Enlarges Number of Ground Flat Stock Standard Sizes to Over 230

In order to minimize waste in cutting dies, punches, tools and parts from precision ground flat stock, the DoALL line of oil hardening tool steel has been



DoALL Flat Ground Stock being cut accurate to layout with a DoALL Band Machine.

increased to 238 standard sizes ranging from $\frac{1}{16}$ " to $1\frac{1}{2}$ " thickness and $\frac{1}{16}$ " to 14" widths in 18" and 36" lengths. This makes it possible for a user to select the size most closely suited to any given requirement. These sizes are carried in stock. Special sizes can usually be supplied on short notice. Literature and prices available upon request.



Note: These New
DoALL STORES
in
Expansion Program for
BETTER SERVICE*

CALL DoALL locally at these Sales-Service Stores

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Call DoALL: Birmingham 3-0502

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89 Washington St.

Call DoALL: Longwood 6-9555

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1063 Kenmore Ave.

Call DoALL: Riverside 3424

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121 St. Emanuel

Call DoALL: Capital 6588

INDIANAPOLIS 2, IND.

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Call DoALL: Plaza 6496

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Call DoALL: Jacksonville 9-7087

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PINDLES...
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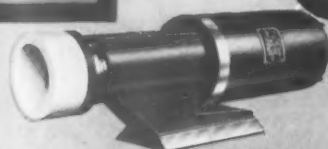
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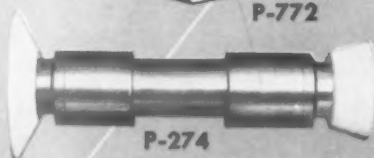
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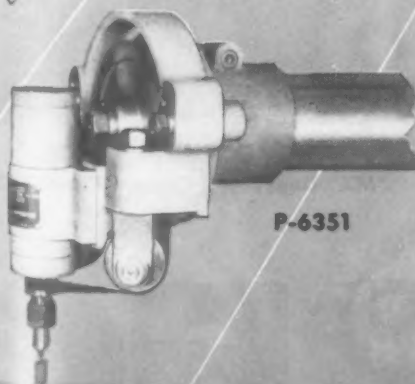
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For the best spindle that the highest skills and most modern equipment, plus 30 years of experience, can produce, specify **POPE.**

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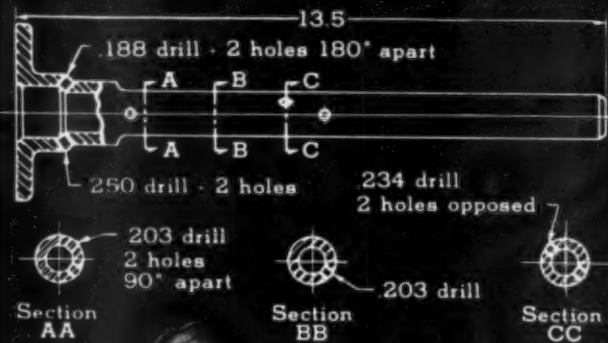
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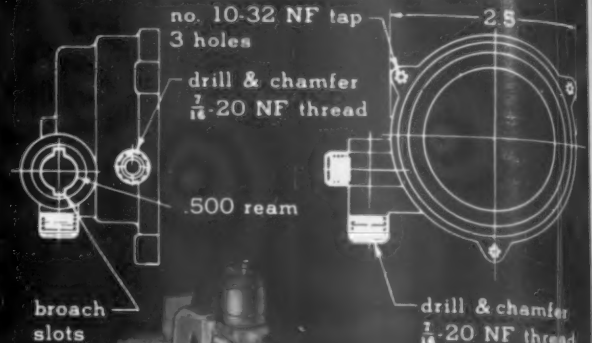
81-69

Shaft for 9 operations from 6 directions



155 PARTS AN HOUR GROSS. This non-index machine has one fixture in the center that holds the shaft with its axis vertical. Four horizontal and two angular units drill all nine holes at the same time. Clamping and unclamping are automatic.

Choke housing for 9 operations from 3 directions



305 PARTS AN HOUR GROSS. On this 20-inch "Auto Index" horizontal units work on two faces. Two units are 45° left of radial lines through the fixtures; three units and an air cylinder for the broach are 45° right. A vertical unit taps three holes.

One Kingsbury replaces

Special-purpose high-production machines use automatic units to perform thousands of operations per man-hour

Dear Sir:

How many operations do these four Kingsburys do in an hour? If you multiply the number of operations per part by the production at 80% efficiency you get —

Shaft	1116
Choke Housing	2196
Transmission part	5856
Throttle Body	4800

Compare the number of operations that standard machines do in an hour with these Kingsbury figures. That gives you an idea how many standard machines one Kingsbury can replace.

Several machines in one

Each machine has several automatic drilling and tapping units ($\frac{1}{2}$ to 5 hp) that operate at the same time. Each unit does the operations that one standard machine would do.

On the machine for the Shaft all units operate on the same part at the same time. The other three machines have index tables with a number of duplicate work fixtures. The units operate at different stations. The table indexes to present each part in turn to each station.

All this in 7.4 seconds

For example, the Throttle Body machine does all this in 7.4 seconds:

In front the part is unclamped. The man removes it and replaces it with another part. (The right view is the plan view in the fixture.)

At station 1 on his left a milling unit mills the face of another part.

At station 2 a vertical unit counterbores another part 1.518.

At station 3 a horizontal unit drills for the tapped hole. A 4-spindle vertical unit drills three holes at station 3 and spot drills at station 4 because the center distances are so close.

At station 6 in the rear an angular unit drills the .136 hole.

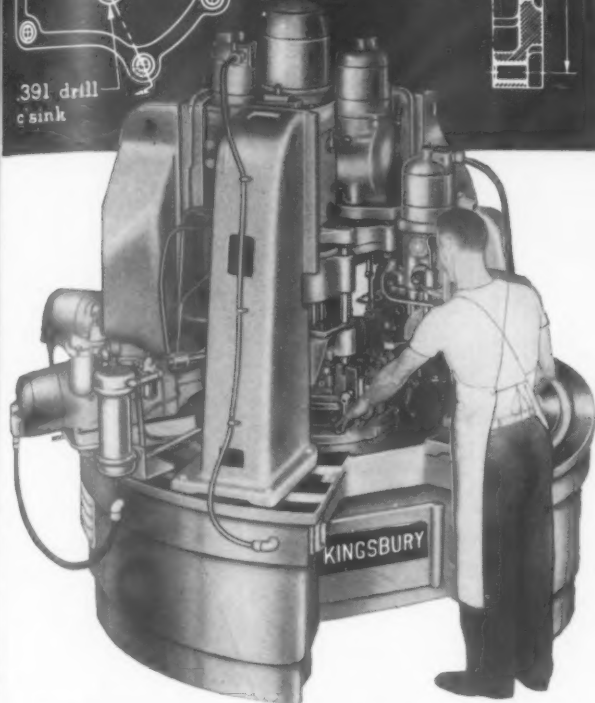
Transmission part for 24 operations from 2 directions

2 $\frac{1}{16}$ ¢ per part

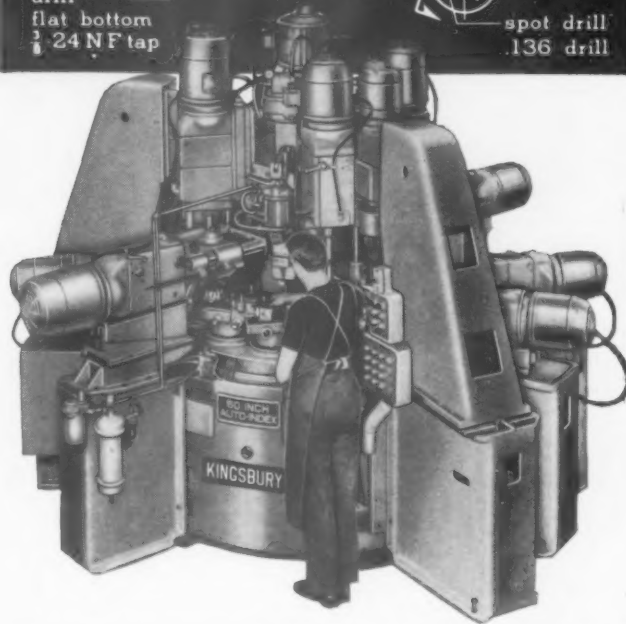


Throttle body for 15 operations from 3 directions

3 $\frac{6}{10}$ ¢ per part



305 PARTS AN HOUR GROSS. A 20-inch power index table has eight fixtures. Three horizontal units drill .297 in steps for a short time cycle. Two others ream and tap. Four vertical units with multi-spindle heads do the nine holes in the left view.



400 PARTS AN HOUR GROSS. Here is a 60-inch automatic indexing machine, the largest size we build (and ever hope to). It has one angular and four horizontal units on knees that are bolted to the base and six vertical units on the central column.

many standard machines

At station 7 a vertical unit reams the throttle bore 1.473.

At station 9 a vertical unit finish step reams the throttle bore and a horizontal unit flats the bottom of the tapped hole.

At station 10 a 2-spindle vertical unit reams two holes .375 and a horizontal unit taps $\frac{3}{8}$ -24.

At station 11 on his right a vertical unit with a combination tool end mills the face to remove tool marks and countersinks the throttle bore.

All that takes 7.4 seconds. Indexing takes 1.6 seconds. So the total time cycle is (theoretically) 9.0 seconds. That means a gross production of 400 parts an hour (3600 secs. ÷ 9 secs.).

This machine has no units at stations 5 and 8, so our customer can add operations if the product should change. On any Kingsburys you can relocate units and change speeds and feeds. Compared to general purpose machines they are not too flexible.

But their output is just terrific.

Sincerely,
Kingsbury Machine Tool Corp.
96 Laurel Street, Keene, N. H.

KINGSBURY

Each unit cost on the drawings

includes the cost of the man and of the machine - no power or overhead. We assumed:

Unit cost of the man equal to:
average U.S. hourly wage
hourly gross × 80% efficiency

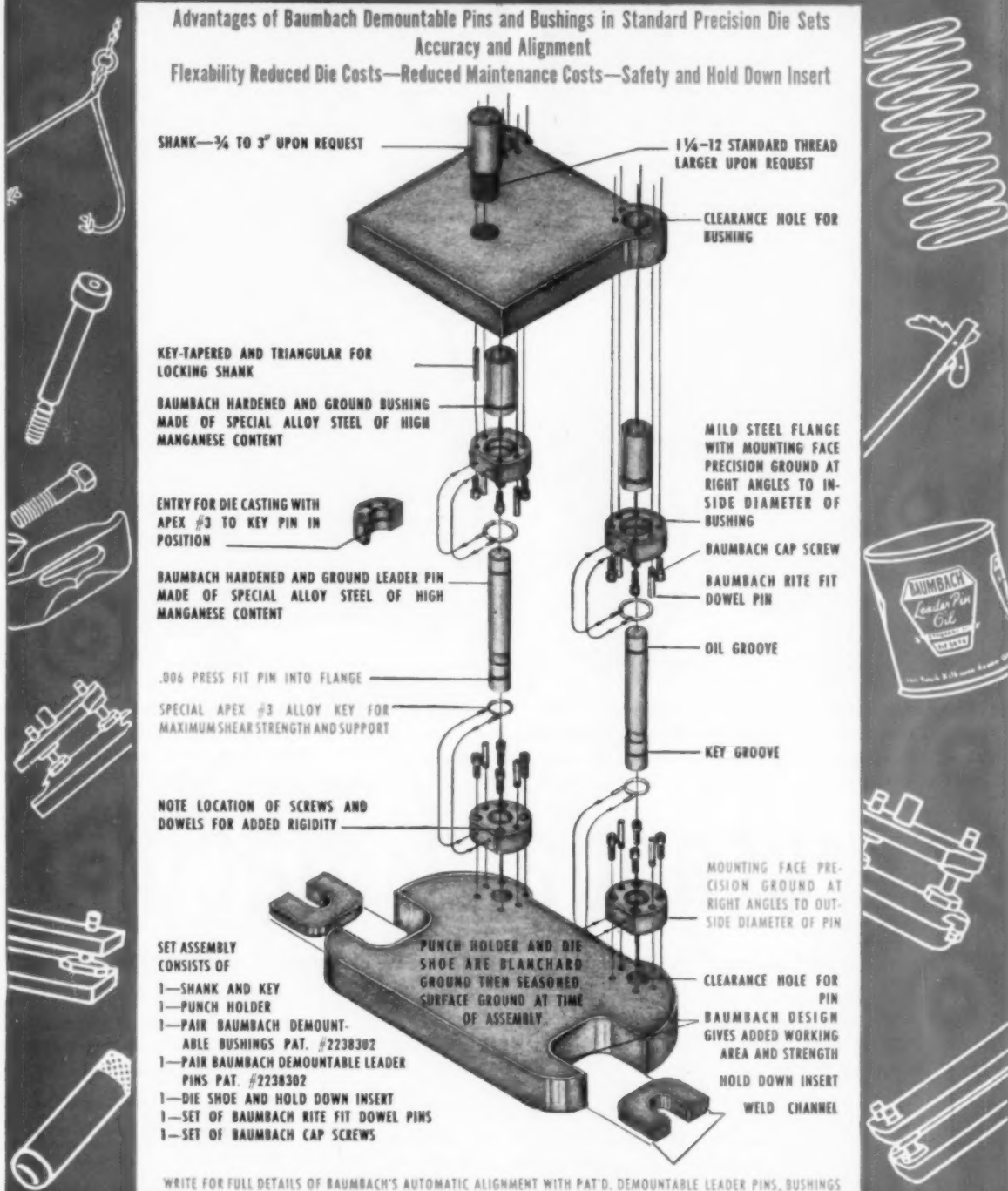
Unit cost of the machine to be:
price of tooled machine
output in 6000 hrs. @ 80% eff.

**AUTOMATIC DRILLING
& TAPPING MACHINES**
for Low-Cost High Production

E. A. BAUMBACH MFG. CO.

1812 SO. KILBOURN, CHICAGO 23, ILL.

Advantages of Baumbach Demountable Pins and Bushings in Standard Precision Die Sets
Accuracy and Alignment
Flexibility Reduced Die Costs—Reduced Maintenance Costs—Safety and Hold Down Insert

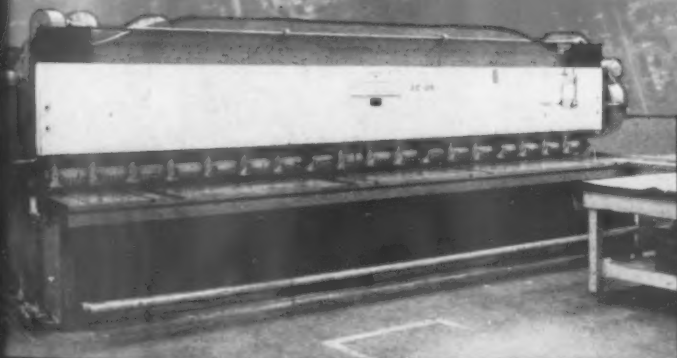


DIE SET, LAYOUT SHEETS AND CATALOGS FURNISHED UPON REQUEST



CINCINNATI Shears at CONVAIR

Photos: Courtesy Consolidated Vultee Aircraft Corp., Fort Worth, Texas.



This $\frac{3}{16}$ " x 18' Cincinnati All-Steel Shear, one of the Cincinnati units at Convair, has the length to cut full length standard sized sheets.

Cincinnati All-Steel Shears at Consolidated Vultee Corporation are shearing sheets straight and true in the important production of the world's largest bombers.

Illustration shows a $\frac{3}{16}$ " by 18' Cincinnati Shear, one of the Cincinnati units at Convair. Aircraft production requires unusual length as well as unusual accuracy in shearing. Cincinnati furnishes shears to the aircraft industry in lengths up to and including 24' of length in $\frac{1}{4}$ " thickness.

Cincinnati All-Steel Shears will give you accurate performance. Write for Shear Catalog S-6.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

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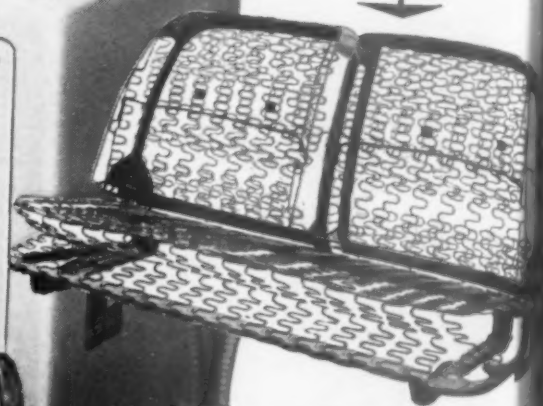
Service life increased

60 times



← The Zig Zag Wire Forming Machine is used to make springs for automotive seats and furniture.

↓ This view of an automobile seat frame shows how the Zig Zag springs are used.



Zig Zag Spring Company
Los Angeles, California

Application:

Slide block operating at 1000 cycles per minute and transmitting 4½ HP. A severe shock application that destroyed a roller bearing assembly after 4 days' operation and ordinary bearing bronze in less than a month.

Solution:

AMPCO METAL

Results:

Ampco Metal slide blocks have resisted wear for 5-years in round-the-clock service. Although close tolerances must be held, no adjustments due to wear have been required on Ampco Metal slide blocks during this period.

IT'S PRODUCTION-WISE TO AMPCO-IZE!



Flywheel — Centrifugally-cast.



Can forming die — Centrifugally-cast.

with AMP^{CO}^{*} METAL

Sixty times longer service life and still going strong. That's the story of the slide blocks used in Zig Zag Wire Formers. And the service is tough too — involves high speeds, severe shock loads.

As a result, 25 Ampco Metal parts are used in the Zig Zag Wire Former. The company reports that in 5 years no Ampco Metal part has been replaced or adjusted in any machine, despite high operating speeds and tremendous shock loading.

Mr. Harry H. Norman, Chief Engineer of the Zig Zag Spring Company, says that the long-wearing properties of Ampco Metal have contributed substantially to the success of their Spring Former.

Take a look at your wear problems. Perhaps Ampco Metal is the low-cost solution. Easy to use because it is available in practically any form required—sheet, plate, sand and centrifugal castings, forgings, bars, tubes, welding wire and electrodes. Consult your nearest Ampco field engineer or write us for further information.

*Reg. U. S. Pat. Off., Ampco Metal, Inc.



Marine reversing gear component — Sand-cast.



Bushings — Centrifugally-cast Ampco Grade 18 standard bars.

Tear out this coupon and mail today!

Ampco Metal, Inc.

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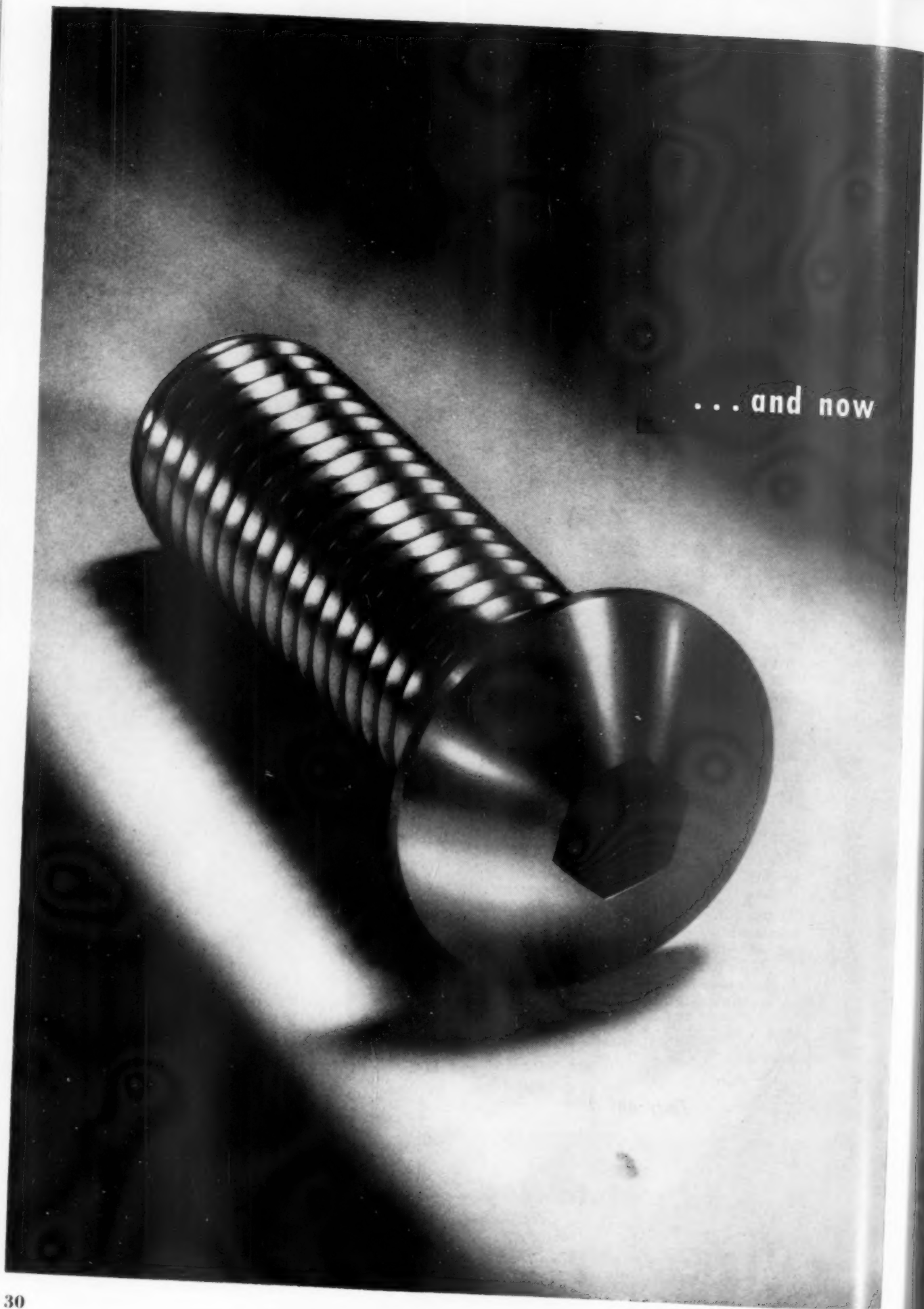
AMP^{CO} METAL INC., Dept. TE-6, Milwaukee 46, Wis.

Send me your free Ampco Metal literature giving descriptions and general applications of Ampco Metal.

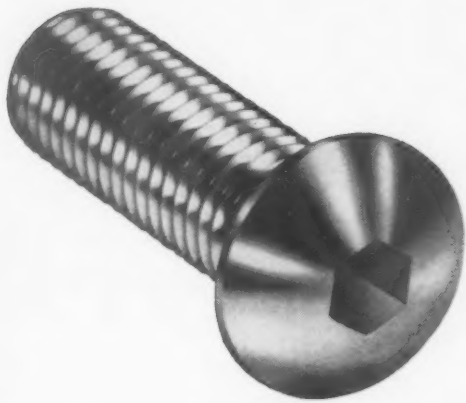
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...and now



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These UNBRAKO screws are strong, accurate and uniform. They are designed for applications where countersinking is not practicable. They feature:

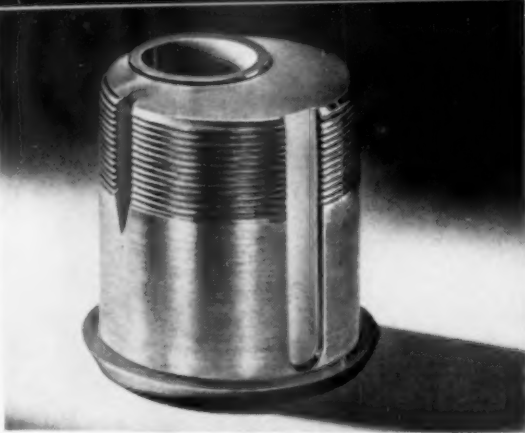
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- Low head height that streamlines design
- Nonslip drive that speeds assembly
- Nonburr socket that eliminates injuries from sharp splinters
- Class 3 fit—an UNBRAKO standard
- Stocks at your UNBRAKO industrial distributor
- Standard sizes—# 8 through $\frac{3}{8}$ " diameter

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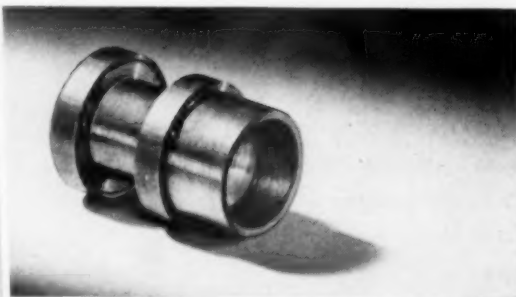
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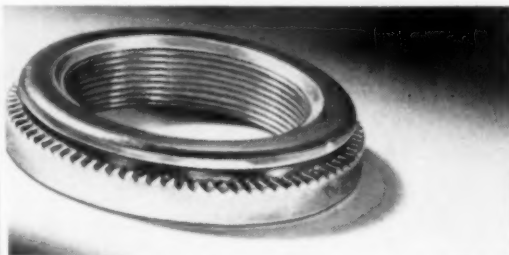
SPS
JENKINTOWN PENNSYLVANIA



LOCK CYLINDER. Metal: 1 $\frac{3}{8}$ " dia. brass
• Machine: model 601 New Britain Gridley
• Operations: *cross slide*—rough form, finish form, break down cut off, side mill, vertical end mill, final cut off; *tool slide*—face, drill offset hole, ream and counterbore offset hole, thread
• Spindle Speed: 1,324 rpm • Feed: .006" per revolution • Tools: high-speed steel • Cycle Time: 7.3 seconds



CARPENTER'S PLANE PART. Metal: $\frac{9}{16}$ " B1113 steel • Machine: Brown & Sharpe Automatic Screw Machine • Operations: *front cross slide*—form; *rear cross slide*—cut off; *turret*—feed stock, spot drill, drill $\frac{1}{2}$ " hole, tap drill, reverse spindle and tap left-hand thread
• Spindle Speed: 1,180 rpm • Feed: .0025" per revolution • Tools: high-speed steel • Cycle Time: 30 seconds



KNOB INSERT. Metal: 1 $\frac{1}{8}$ " round aluminum
• Machine: model 61 1 $\frac{1}{2}$ " New Britain Gridley
• Operations: *cross slide*—form, knurl, cut off; *tool slide*—spot drill, tap, ream, recess • Spindle Speed: 1,600 rpm • Feed: .005" per revolution • Tools: high-speed steel • Cycle Time: 7 seconds

SUN OIL COMPANY, Dept. TE-6.
Philadelphia 3, Pa.

I am having trouble possibly caused by an inadequate cutting oil. I would like ☐ the services of a Sun representative; ☐ the booklet "Cutting and Grinding Facts."

Name

Title

Company

Street

City Zone State



MORE THAN 300 PARTS ARE MACHINED with the aid of one cutting oil for tools and hardware items made by Sargent & Co. Raw materials worked are: B1113 steel, 11ST-3 aluminum, ASTM-B140-46 Type B half-hard bronze, B16-46 brass, and Type 416 stainless steel. Stock ranges from $\frac{1}{16}$ " wire to 2" bars.

SINGLE GRADE OF SUNICUT REPLACES 4 CUTTING OILS

A good example of cutting-oil economy and efficiency is provided by Sargent & Co., well-known hardware and tool manufacturers. Their complete line requires the machining of more than 300 parts from a wide range of metals. A few years ago this company was using four different cutting oils, purchased in drums. By switching to a single product, Sunicut 11W, and buying it in bulk, Sargent has been able to effect an annual saving of about \$3,000. All operations are performed as well as before, or better—and shop efficiency is up.

Sunicut 11W is a low-viscosity, dual-purpose cutting oil for automatics machining all nonferrous metals and free-machining steels such as B1112 or B1113. Its transparency permits quick and accurate miking. It will not stain brass or copper under normal conditions. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion.

Other Sun cutting oils offer similar opportunities for improved operations and economy. For information about them, or the help of a Sun representative, use the coupon at the right.

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THE TOOL ENGINEER

Publication of The
American Society of
Tool Engineers

The Tool Engineer

a Letter from the Editor...

Recently a noted economist, commenting on the future business outlook for American industry, advanced the thought that industry's research was a factor not to be overlooked in trying to predict what business might be like a couple of years hence.

This is a sound thought. And that it is not based on optimism alone is attested by the bright array of postwar materials and products which have not only expanded existing markets, but in many cases established entirely new markets.

Now the point is that there are two kinds of research. There is product research, with which all laymen are familiar, and which can provide industry with new market goals by providing it with new products and materials to improve present products.

There is also research concerned with cutting the manufacturer's production costs on both his existing and future lines. This is as spectacular as the other to the layman, but not always as well understood.

And here the tool engineer and the tool-producing industry have a message to carry to both industry and the public. Some of our large industry has helped to write the message; they are doing their best to help us carry it.

No manufacturer would consider mass production of an obsolete automobile; he takes steps to insure that his product is at least competitive. But in too many cases he still remains to be sold on the proposition that only the same type of continued investigation will insure that his manufacturing methods and tooling, say five years from now, will be the equal of his competitors'.

It is a proposition which has sound dollars-and-cents figures to back it up. Let's use them!

Gilbert P. Muir



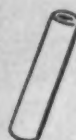
Deep-drawing with

FEWER DRAWS

A 10-DRAW CIVILIAN JOB

AN 8-DRAW DEFENSE JOB

CUT TO
3 DRAWS



CUT TO
4 DRAWS

Towle does **BOTH** on **MULTIPRESS®**

Multipress does it again—this time on deep drawing operations. In addition to smooth, oil-hydraulic pressure control that gets the most out of every job potential, it offers quick, easy convertibility that meets changing production needs in a hurry!

The deep-drawn tubes shown above, which are later formed into five sterling silver napkin rings, are produced on this 35-ton Multipress at the Towle Manufacturing Company of Newburyport, Mass. Starting with a flat, 7¼" disc, the first draw produces a cup-like shape. The second draw deepens and narrows the cup, and the third produces a 1¾" tube 7" long.

In only three draws, Multipress forms a tube that took ten draws by the old method!

Converted to defense work, the same Multipress forms special tubes used in rocket tail-fin assemblies. Instead of the eight draws formerly needed, Multipress does it in four! Dimensions of the tail-fin units must be held to very close tolerances, as they are used in high-precision assemblies. An aluminum disc 4⅞" in diameter is drawn to round tubing 1⅞" across the bottom, 3⅞" deep, and flared to 2⅜" across the top. Production rate is 7200 units per 8-hour day—with scrap losses held to a negligible factor.

Another Multipress at Towle paid for itself in three months by reducing several eight- and ten-draw jobs to only three or four draws—with better results and less scrap.

In still another case, when all five parts of a silver candlestick were preformed on Multipress, savings in a single year equalled the cost of the press.

The Multipress combination of *widely adjustable action* and *smooth pressure control* has proved to be the best answer to an amazing range of production jobs, including drawing, forming, flaring, stamping, crimping, staking, assembling, punching, slotting, blanking, broaching, trimming—and so on. Eight Multipress frame sizes offer capacities from one to 50 tons. Write for full details today!



THE DENISON ENGINEERING COMPANY

1191 DUBLIN RD., COLUMBUS 16, OHIO

The Tool Engineer

Editorial

The Responsibility of Membership

Last month we pointed out the unique nature of ASTE in terms of the degree of participation in Society operation, policy-making and direction which is exerted by each of us as individual members.

There is another aspect to this which is equally important, that is the exercise of the responsibility of our individual membership to participate in Society functions. There probably is not a single chapter in our Society which does not have at least one chapter committee that requires strengthening and that additional efforts of capable members can be utilized.

It is obviously apparent that the work of the chapter committees can be broadened immeasurably by the increased participation of chapter members qualified to contribute, but who have not realized the potential good to the chapter by their participation.

On the national scene, an able, progressive Board of Directors depends on the foresight and ability of a discerning House of Delegates. A responsible delegate is the product of an alert, progressive chapter, and as a result the chain starts with participation at the chapter level on a regular, rather than an occasional basis.

This brings us to the foundation of any strong national technical organization—the regular monthly meetings of its local chapters.

Probably no other single activity has so great an effect on the vitality and progress of our organization, because the health and vigor of the entire organization depends directly upon the health and vigor of our chapters. While the assigned responsibility for chapter programs, for example, may rest with one appointed group, the best effort of our most capable men is largely nullified by our non-participation and our non-attendance.

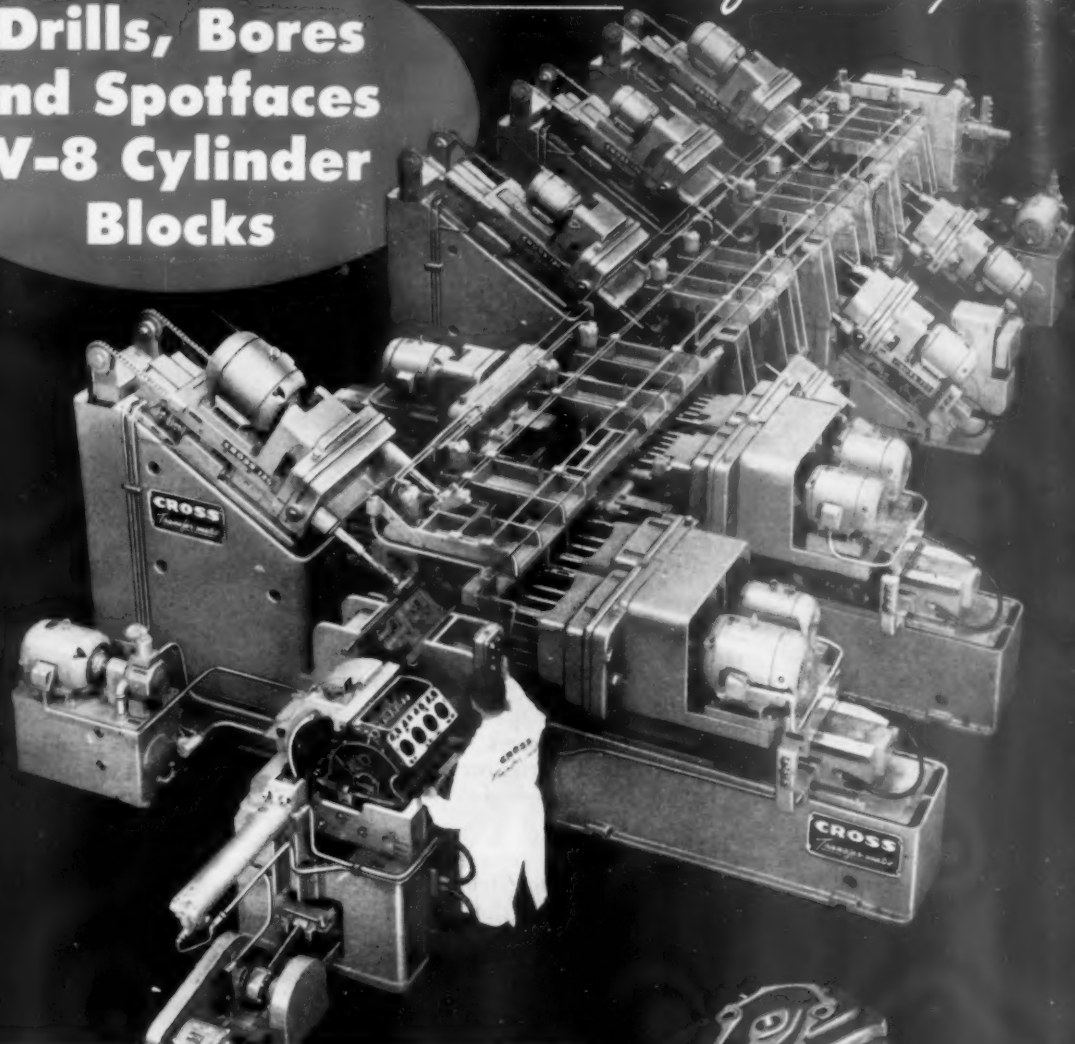
Attendance at chapter meetings, constructive criticisms, and our full participation in the chapter's activities is the responsibility of our membership.

L. B. Bellamy

PRESIDENT
1952-1953

Drills, Bores and Spotfaces V-8 Cylinder Blocks

Another Transfer-matic by Cross



- ★ Drills, bores, spotfaces and reams 120 V-8 cylinder blocks per hour at 100% efficiency.
- ★ 19 stations—one for loading; ten for drilling, boring, reaming, countersinking and spotfacing; two for gaging; one for cleaning; four idle; one for unloading.
- ★ J.I.C. standard hydraulic and electrical construction with stranded wire.
- ★ Hydraulic locating, clamping, positioning and transferring.
- ★ Cross Machine Control unit to automatically stop machine when tools need changing.
- ★ Pre-set tools.



Established 1898

THE **CROSS** CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

Precision Grinding of Cylindrical Parts

By **A. E. Mandeville**

and

J. Meehan

APPLICATION ENGINEER

DIRECTOR OF SALES

GRINDING MACHINE DIVISION
BROWN AND SHARPE MANUFACTURING COMPANY

THE QUESTION may be asked why should an attempt be made to grind to a tolerance of 0.000025 in. (25 millionths of an inch) when it is known that such accuracy is difficult to obtain by both grinding and lapping. The reason is that the particular projects as presented by the customer prevent the application of the lapping process to give the desired results. In the very first case encountered, an adjacent shoulder prevents proper use of a lap. The other jobs would not tolerate the dropping off at the edges which resulted from lapping.

High-speed reciprocating aircraft engines, diesel engines, and guided missiles in general, have provided the principal projects requiring grinding to split ten-thousandths of an inch tolerances. The diameters to be ground are about one-half inch or less. The parts are relatively rigid and well adapted to grinding on dead centers. See Fig. 1.

In the initial case history, a mid-western concern requested a proposal on a plain grinding machine for grinding two diameters, one at each end of a small rotor shaft. These diameters were to be ground to a specified dimension, standard to plus 0.000025 inch. The surface finish was specified as 2 micro-inches rms or less, and round within 0.000010 inch. While a plain grinding machine is regularly considered to be capable of grinding work on a production basis to limits of plus and minus 0.0001 inch, there was hesitation to give assurance that the specifications called for could be satisfactorily accomplished or maintained. After consultation it was agreed that if the customer would furnish samples of the work prepared for grinding, tests would be conducted to determine the practicability of their request. Later, a drawing of the part was received bearing the following specification: Size—0.3125 in. standard to plus 0.000025 in. Round—within 0.000010 in. Taper—not to exceed 0.000012 in.

In the study of the machine requirements for the job, it was determined that certain refinements must be made in a basic machine to assure repetition of size to limits closer than plus or minus 0.0001 in.

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

In the instance related here, these refinements generally were:

(1) The stock machine was dismantled, and all sliding surfaces and alignments of the wheel slide, and sliding and swivel table units, were reworked to what shop men refer to as zero-zero tolerances—that is, as near zero as possible.

(2) The axis of the wheel spindle was made precisely parallel with the bed ways. The wheel slide abutment surfaces and thrust bearing surfaces were made square with the wheel slide ways to extreme nicety.

(3) The crossfeed index dial was arranged to provide split-tenth adjustment of the wheelslide.

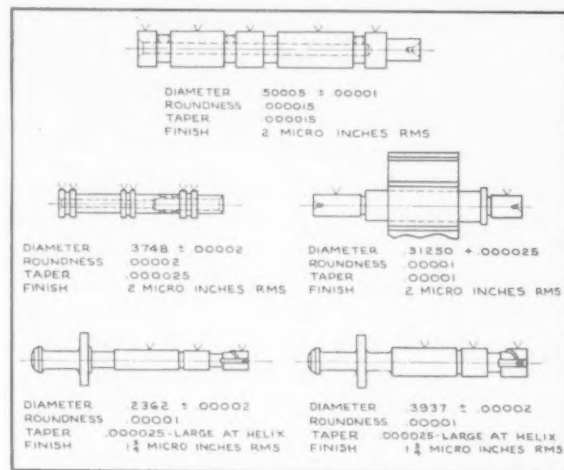


Fig. 1. Parts to be ground are relatively rigid and well adapted for grinding on dead centers.

(4) Particularly important is the alignment of the headstock and footstock. These members were lined up with meticulous care. This alignment is a characteristic which must be taken into account when grinding to close tolerances of size and taper, because if there is misalignment in the headstock and footstock, the slightest variation in the work length destroys uniformity of size and taper. To illustrate this point, see Fig. 3 for the effect of machine alignment.



Fig. 2. This plain grinder, 3 x 18 in., was adapted for the first trial run for grinding two diameters to close tolerances.

Other factors of vital importance which only experience, patience, and experiment could determine were selection of wheel; number of operations (or handlings); coolant; wheel truing and dressing; machine centers, and work centers or centerholes; taper control; measurement.

Selection of Wheel. The general opinion has existed, and commonly so, that a fine or smooth surface finish demands a fine grain wheel. For many years, finishes from 1 to 2 microinches rms have been ground on plain grinding machines. Grinding wheels up to 500 grain were usually employed on such operations.

However, when grinding parts such as diesel fuel injector plungers and guided missile parts which have interrupted surfaces or narrow bands, it is necessary that a free cutting wheel be used. Such parts in use require that there be no falling away at the edges or ends of the ground surface which would be detrimental to the efficient operation of the mechanisms, which are subjected to extremely high gas or oil pressures.

It has been found that surface finishes from 1 to 2 microinches rms can be produced on high-carbon steel with an 80-grain grinding wheel. The coarse 80-grain wheel grinds at a lower grinding pressure and is freer cutting than a finer grain wheel, thus contributing to full diameter at the edges of recesses, or the ends of the piece.

After trying many different grades of wheels to meet the conditions at hand, grade M proved to give the best results in these experiments. Although somewhat hard for the material being ground, it contributed to maintenance of size, and produced the high surface finish required; the openness of the wheel contributed to freer cutting. To further

reduce the grinding wheel pressure, a narrow ($\frac{1}{2}$ -in. wide) straight-sided wheel was used.

Wheel Truing and Dressing. Utmost care must be exercised in wheel truing, a factor too often neglected. A table-type wheel truing fixture proved to give better results than the footstock type, because it provided more substantial support for the diamond. A truing speed of approximately 7 inches per minute gave the desired results. Sharp diamonds are generally recommended, particularly when fine-grain wheels are employed. In this instance, using an 80-grain wheel, a superior finish was obtained on the work by dressing the wheel with a slightly dull diamond.

Coolant. Although selection of coolant is often stressed as an important factor in grinding operations, it did not in this instance present a problem. Excellent results were obtained with a regular coolant. As might be expected, filtering the coolant was a very serious matter, but a suitable filter was found.

Machine Centers and Work Centers or Center Holes. A very important factor in cylindrical grinding is the condition of the centers and center holes. Good quality commercial centers are not good enough when grinding to extremely close tolerances. The quality of machine centers, and the work centers or center holes, should be commensurate with the quality of work to be ground on them. The center points must be as round as it is possible to make them and concentric with the taper shank. These conditions are equally as important as the alignment of the headstock and the footstock.

The requirements of the center holes in the work are similar to those for the center points; they must be round, smooth, and clean. So far it has been found necessary in all instances, preparatory to finish grinding, to lap the center holes, or regrind the center points on the work, as the case may be. The degree of roundness of the center holes or center points of the work directly affects the finished surface quality of the work. For long-run jobs tungsten carbide tipped centers are recommended. While it is difficult to produce a precisely round center point on carbide tipped centers, due to the bi-metal condition, it is well worth the effort.

Taper Control. In order to point out the necessity for exceptionally good taper control, briefly consider the variables which make up the 0.000025-in. total tolerance.

(1) Master gage calibration error. If carefully done against the best gage blocks, this error can be held to about plus or minus two millionths of an inch, or a spread of 0.000004 inch.

(2) Repeat accuracy of comparator used to check work against master. The comparator that was used allowed repeats in error of plus or minus one

millionth of an inch or a spread of 0.000002 inch.

(3) Temperature difference between work and master. By experiment, it was found that the thermal expansion could be safely neglected due to the small diameters being handled, and the slight temperature changes caused in grinding.

(4) Taper in work. The above effects already add up to slightly more than six millionths of an inch, leaving less than 20 millionths of an inch for taper and machine accuracy of duplication. Only by removing practically all taper is it possible to approach closely the usually assumed figure of 0 and leave the machine a reasonable share.

The requirement of less than 0.000025 in. variation from piece to piece is met by the above described accuracy of alignments and by a well proportioned wheelslide, fed precisely by a strong crossfeed screw and solid nut, and rugged thrust bearing members. On the projects with ground length over $\frac{1}{2}$ inch, the necessary requirement of almost no taper was accomplished by application of the Electralign, which is a very recent result of serious consideration given to precise adjustment of the grinding machine swivel table.

This new device accurately measures small angular movements of the swivel table. Two strain-gage

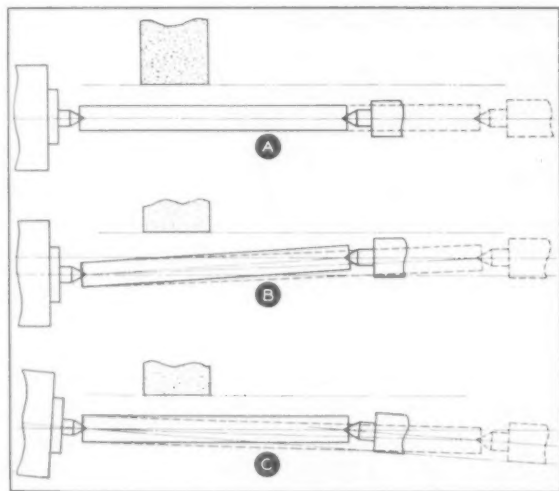


Fig. 3. Variation in work length affects accuracy, and, as shown here, the headstock and footstock must be aligned.

measuring elements are used, one at each end of the swivel table. Electrical signals from these two measuring elements are automatically combined and amplified, to give an easily read meter deflection proportional to angular movement of the swivel table only, and completely ignoring slight in or out movements of the swivel table caused by unavoidable deflections or by looseness of the pivot center. To emphasize this point, the motor does not show the effort exerted, which may be and usually is either too weak or too strong; instead, it shows the actual effect of angular displacement which

causes the change in taper. As applied to the 3 x 18-in. plain grinding machines used for the accurate grinding described here, the Electralign allowed a taper change of 0.0001 inch in diameter in a 10-inch grinding length to be displayed as one 5/32-inch meter deflection. Since this is only 0.00001 inch in one inch, the device was used to observe swivel table changes to an accuracy of about 0.000001 inch per inch of length. In other

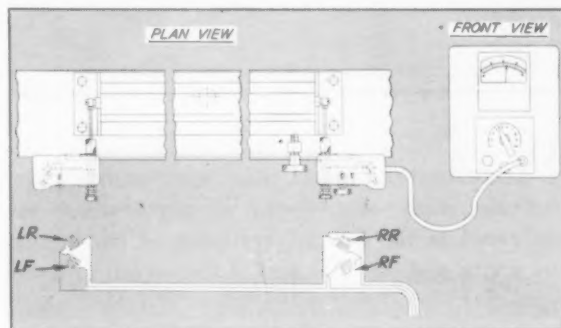


Fig. 4. Schematic diagram of the Electralign which accurately measures small angular movement of the swivel table.

words, the taper problem was reduced to one of measurements of the taper only, which was quite easy with the high-magnification comparator used.

Measurement. When grinding to split-tenth tolerances the most dependable measuring equipment is required. The measuring medium must be as free as possible from the variations due to the human element. It is necessary to provide the operator of the machine with a master piece or gage, a comparator, and an amplifier capable of indicating increments of 0.000010 inch on diameter with high assurance.

It was preferred, when working to limits of 0.000025 inch or less, to use a comparator and an amplifier independent of the Electralign. With this arrangement the Electralign amplifier is a "watch dog," constantly warning the operator of the slightest disturbance in position of the swivel table, and indicating in direct figures the taper change which may occur, and giving the operator a chance to make proper corrections.

Stock removal. The amount of stock removed in a given time, the uniformity of size, and the surface finish are quite definitely related to each other. After many trial grinds it was determined that three grinding operations were necessary to obtain the desired results. The specifications of these operations were based on 0.010-in. stock for grinding as follows:

1st Operation: grind to within 0.0015 to 0.001 inch of finish size.

2nd Operation: grind to within 0.0003 to 0.0002 inch of finish size.

(Continued on page 56)

Fixed Gage Standards and Practice

By William H. Gourlie

STANDARDS ENGINEER
THE SHEFFIELD CORPORATION

Part I

PLUG GAGES, ring gages, snap gages, contour gages and the many other types of gages which are embraced in the general grouping of fixed gages are a vital and essential part of the overall program to control quality. As a functional check, as a means of assuring mating parts, fixed gages are doing an excellent job. When quantities are limited and where tolerances are moderate or liberal, fixed-type gages may cover requirements adequately.

Gages originally took the form of master components. It is natural that if all male parts fit one female master and all female parts a mating male master, such male and female parts will assemble with each other. These were the forerunners of maximum metal limit (GO) gages. Gradually simpler designs of gages were found to be equally effective and the use of plug, ring and snap gages became general. Refinements in design and increases in quantities manufactured led to the development of the limit system and the minimum metal limit (NOT GO) gages. Quality was improved by definitely limiting maximum tightness and looseness. Economies were effected by working to a tolerance zone instead of to a basic dimension.

No type of gage, once developed and used in industry, has ever disappeared entirely from use. Design changes in many instances have greatly altered the appearance of the gage. Not many one-piece plain plug gages are now seen, but rather the double-end wire type, taper lock and tri lock styles. Similarly, details of designs for many fixed-type gages have been developed and standardized through the work of the American Gage Design Committee. The AGD standards have been accepted by users and by gage manufacturers. By working to standard designs, gage blanks and handles may be made in quantity; overall production is greater; costs are lower; deliveries are better. If a handle and one member are available, the mating member may be procured from the most easily available source. All interested persons should become familiar with

the details of the AGD Standards and specify them for these types of gages: (1) Plain plug gages—wire type, taper lock, tri lock, annular; (2) Plain ring gages; (3) Thread plug gages—taper lock, tri lock, annular; (4) Adjustable thread ring gages; (5) Adjustable limit snap gages, Models A, B, C, E, MC; (6) Adjustable limit length gages, external and internal; (7) Master disks; (8) Plain taper plug and ring gages; (9) Spline and serrated plug and ring gages.

Gage Tolerances

The scope of the American Gage Design Committee is limited to blanks and does not embrace tolerances for finished gages. Such tolerances have been established through the activities of other

TABLE I—TOLERANCES FOR PLAIN PLUG AND PLAIN RING GAGES

Nominal Size—Inches		Gagemakers' Tolerances Classes			
Above	To and including	XX	X	Y	Z
0.029	0.825	0.00002	0.00004	0.00007	0.00010
0.825	1.510	0.00003	0.00006	0.00009	0.00012
1.510	2.510	0.00004	0.00008	0.00012	0.00016
2.510	4.510	0.00005	0.00010	0.00015	0.00020
4.510	6.510	0.000065	0.00013	0.00019	0.00025
6.510	9.010	0.00008	0.00016	0.00024	0.00032
9.010	12.010	0.00010	0.00020	0.00030	0.00040

standardization groups and from practices within the gage industry, and are summarized in Tables I and II.

Tolerances for AGD Adjustable Limit Snap Gages. Snap gage anvils should be adjusted and locked properly. Then, locating from the anvils on one side (the solid anvil of model SC snaps), the gaging surfaces on the adjustable buttons or pins should be parallel within:

Frames 1 to 3	0.0002 inch
Frames 4 to 6	0.0003 inch
Frames 7 to 10	0.0004 inch
Frames 11 to 16	0.0006 inch

The question of direction, plus or minus, in the

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allocation of gage tolerance has always been troublesome. Two general theories and many modifications of them have been advanced to answer this question. One is the Bilateral theory wherein the limits of the gage tolerance zones are bisected by both high and low limit lines of the work tolerance zone. This is commonly used for hole locations, center distances and the like. The other is the Unilateral theory wherein the work tolerance limits entirely encompass gage tolerance zones; that is, all high limit or NOT GO tolerances are negative, and all low limit or GO tolerances are positive in the case of plug gages. This is one of the essential characteristics of the gaging policy of the Ordnance Department.

In one commercial practice the NOT GO plug gage tolerance is bisected by the maximum limit of the work tolerance zone, while GO plug gage tolerance is held entirely within the minimum limit of the work tolerance zone.

Still another practice for thread plug gages throws the tolerance of the NOT GO gage above the maximum work tolerance limit and that of the GO gage above the minimum work tolerance limit. This practice is used extensively for final inspection or acceptance gages.

It is quite obvious that the final results obtained under such a variety of gaging policies will vary radically.

The unmodified unilateral system of allocating both gage tolerance and wear allowance entirely within work tolerance limits was used by Ordnance during the late war. This reduces manufacturing tolerance by the sum of the gage tolerance on both GO and NOT GO gages, but work tolerances can be strictly maintained.

Actual production practice has been influenced by the amount of product tolerance permitted, and by the degree of maintaining these limits in manufacturing. It is recognized that the policy of allocating gage tolerances within the specified product limits can result in the rejection of borderline parts which actually can be used. Under such a policy, working gages can be made within the product limits, and final acceptance gages can be specified close to basic for the GO gages and outside the product tolerance limit for NOT GO gages. No unusable parts will be passed and more usable parts will be accepted.

Gage Wear Allowance

Every time a plug gage is pushed into a hole or a ring gage is slipped over a work part, it sustains an element of wear which slightly decreases the diameter of the plug gage or increases the diameter of the ring gage. This wear, of course, is cumulative and eventually changes the diameter of the gage sufficiently to make it worthless for that operation.

A wear allowance should be made to compensate

TABLE II—TOLERANCES FOR THREAD PLUG AND THREAD RING GAGES.*

X Tolerances

Size inches	Lead	Thread Angle	Major or Minor Diameters		Pitch Diameter		
			To and incl. 4"	Above 4" diam.	To and incl. 1/16"	Above 1/16" to 4" incl.	Above 4" to 8" incl.
80	.0002	20 wh.	.0003		.0002		
72	.0002	32 wh.	.0003		.0002		
64	.0002	30 wh.	.0004		.0002		
56	.0002	20 wh.	.0004		.0002		
48	.0002	30 wh.	.0004		.0002	.0003	
40	.0002	20 wh.	.0004		.0002	.0003	
36	.0002	30 wh.	.0004		.0002	.0003	
32	.0003	12 wh.	.0005	.0007	.0003	.0004	.0005
28	.0003	12 wh.	.0005	.0007	.0003	.0004	.0005
24	.0003	12 wh.	.0005	.0007	.0003	.0004	.0005
20	.0003	12 wh.	.0005	.0007	.0003	.0004	.0005
18	.0003	10 wh.	.0005	.0007	.0003	.0004	.0005
16	.0003	10 wh.	.0006	.0008	.0003	.0004	.0005
14	.0003	10 wh.	.0006	.0008	.0003	.0004	.0005
12	.0003	10 wh.	.0006	.0008	.0003	.0004	.0005
10	.0003	10 wh.	.0006	.0008	.0003	.0004	.0005
8	.0003	10 wh.	.0007	.0011	.0003	.0004	.0005
6	.0004	8 wh.	.0007	.0011	.0004	.0005	.0006
5	.0004	8 wh.	.0007	.0011	.0004	.0005	.0006
4	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
3	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
2	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
1 1/2	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
1	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
3/4	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
5/8	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
1/2	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
3/8	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
1/4	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
3/16	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
1/8	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
3/32	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006
1/32	.0004	8 wh.	.0008	.0013	.0004	.0005	.0006

W Tolerances

Size inches	GO		MAJOR OR MINOR DIAMETERS			PITCH DIAMETER			TOTAL CUMULATIVE TOLERANCE		
	To & Incl. Basic	Above Basic	To & Incl. Basic	Above Basic	Above Basic	To & Incl. Basic	Above Basic	Above Basic	To & Incl. Basic	Above Basic	Above Basic
80	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
72	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
64	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
56	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
48	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
40	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
36	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
32	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
28	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
24	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
20	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
18	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
16	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
14	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
12	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
10	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
8	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
6	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
5	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
4	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
3	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
2	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
1 1/2	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
1	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
3/4	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
5/8	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
1/2	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
3/8	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
1/4	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
3/16	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
1/8	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
3/32	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
1/32	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001

*Wear allowance when specified is one-half the X tolerance for pitch diameter.

for the loss of gage metal due to this wear. The wear allowance thus becomes an increment added to the nominal diameter of a plug gage or subtracted from that of a ring gage. The wear allowance is applied first and the gagemaker's tolerance applied later.

The amount of the wear allowance increment added to or subtracted from the gage diameter may or may not be stated in terms of the work tolerance. It should take into consideration the type of material of which the gage is made, the type of material of which the work part is made, and the character of the gaging operation. A larger wear allowance is required for shop inspection than for final inspection.

Unless a definite value for the wear allowance is specified, there is no logical means of determining the point at which a gage should be scrapped or rehabilitated because of wear. When a definite wear allowance is specified, there can be no misunderstanding. When the wear allowance has been used up, the gage is taken out of commission, either permanently or to be reconditioned, without any further question.

Obviously, if the work part is being manufactured accurately, there will be a minimum of wear on the NOT GO gage. Any wear of NOT GO gages tends to bring them further inside the specified

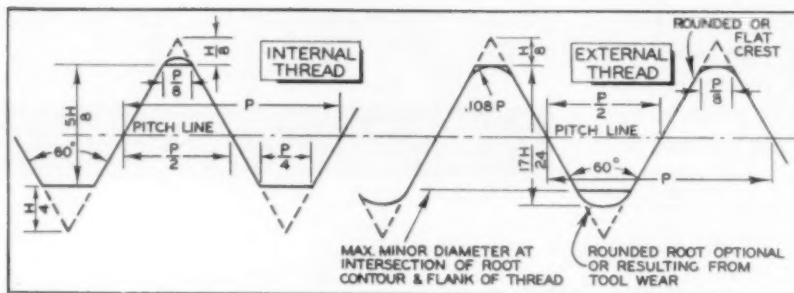


Fig. 1. This thread profile recommended for international use by the ISO comprises a thread angle of 60 deg, with the crest flattened $1/80p$ in width or rounded with a $0.108p$ radius.

product limits. The rejection point of such gages is determined by the amount the manufacturer can stand to have his tolerance reduced. Consequently, it is not common practice to apply wear allowance to the NOT GO gage.

Working gages wear faster than inspection gages for any given volume of production for two reasons. The work part in the shop is seldom cleaned as carefully before gaging as it is in final inspection, and the adhering grit acts as an abrasive on the gage. Furthermore, more than one gaging operation is usually required in the shop, whereas a single operation is often sufficient in final inspection.

Changes in Thread Standards

There have been many references in recent years to something new or different in screw thread standards. It has been said that someone has been tampering with the tolerances and with the marking. Why? Class 2 and Class 3, NC, NF, N and NS were good enough and clear enough for anybody. Why upset them and cause all this confusion, especially now when every effort is needed to increase production? The answer is that every change made recently in thread standards has met a valid need of industry and the several branches of the Armed Forces. In working out these details with representatives of Great Britain and Canada, unification of the thread standards of the three countries has been achieved.

Unified Threads. Considered in terms of time, the world has shrunk. Ships, planes and other mechanisms must be serviced at points throughout the world. A common screw thread standard became a necessity. Unification of U. S. thread standards with those of Great Britain and Canada is a reality. That same thread profile has also been recommended for international use by the ISO (International Organization for Standardization). Briefly it comprises a thread angle of 60 deg, with the crest flattened $1/80p$ in width or rounded with a $0.108p$ radius. See Fig. 1.

Diameter-Pitch Series. Coarse Series $1/4$ to 4 in. and Fine Series $1/4$ to $1 1/2$ in., with the single exception of 1 in.-12 size in the Fine Series, are just as they have been. Other commonly used series and selected combinations such as the Extra Fine,

and Uniform (8-12-16) Pitch Series are unchanged although not all carry the symbol U .

Tolerances and Allowances. Tolerances for Classes 2 and 3 were developed as a function of the pitch. Subsequently, factors of diameter and length of engagement were recognized as of major importance and were taken into consideration when computing tolerances for diameter-pitch combinations other than the Coarse and Fine Series. Close adherence to Class 2 and 3 tolerances developed several major problems including: (1) An appreciable percentage of nuts seized on the bolts before the assembly was made up tightly. (2) A given tolerance was more difficult to hold on internal threads than on external threads. (3) Tolerances for fine pitch threads were more difficult to hold than the coarse. For example, $1/4$ -20 NC and $1/2$ -20 NF carried the same tolerance, as did $9/16$ -12 NC and $1 1/2$ -12 NF. (4) Threads which were to be coated had to be made to special dimensions, either by undercutting the external member or tapping the internal over-size.

Studies, trials and tests were undertaken to determine how these and other problems might best be solved. This work was completed and initial recommendations were ready at about the same time that the unification program was conceived. Thus, in the one revision to these thread standards, unification and the changes in tolerances and allowances have been achieved.

Basic Formula for Computing Tolerances for Unified Threads. The following formula was adopted for computing tolerances on Class 2A Unified threads:

$$0.0015\sqrt[3]{D} + 0.0015\sqrt{LE} + 0.015\sqrt[3]{P^2}$$

(Diameter) (Length of Engagement) (Pitch)

Tolerances of all other classes are derived from this formula for Class 2A by applying the following percentages:

External Threads	Internal Threads
Class 1A—150 percent	Class 1B—195 percent
Class 2A—100 percent	Class 2B—130 percent
Class 3A—75 percent	Class 3B—97 1/2 percent

Gages and gaging of screw threads present many interesting, and at times complicated, problems. There is no one answer which adequately meets all conditions and situations.

(Continued on page 71)

An Analysis of Cost Estimating Principles and Practices

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Part II

THE ESTIMATE form in Fig. 5 indicates the detail that may exist in estimating the costs of auxiliary services of a sizeable production project. Behind the figures that appear on the form is a still more detailed breakdown. For a preliminary estimate, common practice is to analyze the part prints of the product to determine the quantities and kinds of patterns, tools, fixtures, jigs, dies, etc., needed. An overall estimate or a partial breakdown may be made of the cost of each tool. Various departments in the organization such as research, engineering, tool design, etc., are required to submit estimates of the material, labor, and equipment each will have to furnish.

A Detailed Product Estimate

In a detailed cost estimate for a part of a large-size production project, the operations to make the part are itemized. Set-up and cycle times for each operation entered in the first two columns on the left are obtained by adding standard elemental times. Set-up and cycle time are multiplied by the labor and overhead rate for each operation, and the cost for each is entered just below the standard time. The unit set-up and cycle costs are added to obtain the standard cost including labor and overhead.

The weight, unit price, and a ratio enter into the calculation of material cost.

Fig. 6 depicts a procedure for compiling the parts and assembly costs into a total figure for a major unit of a product, in this case the head-stock of a machine tool. The material, labor, and overhead costs for parts and assembly operations are accumulated into sub-assembly groups in the manner illustrated in Fig. 6B. The costs of the sub-assemblies are collected on the unit assembly sheet and added to the costs of the unit assembly operations as shown in Fig. 6C. Figures for administra-

tion and selling costs and engineering and tool costs are added to the manufacturing costs to obtain the total cost for the major unit.

A cost estimate for a redesigned product that has been in existence requires a less complete treatment than for a new product. The parts of the redesigned product are compared with those of the old and classified as revised, added, and unchanged parts. The costs of the unchanged parts are found from production records. Detailed estimate sheets need to be prepared only for changed and added parts and assemblies. Costs for engineering, administration, selling, and new tools and the expected profit are added to the manufacturing costs to get the total selling price.

Fig. 5. Large production projects entail a great amount of detail for auxiliary services as shown in this chart for estimating development costs.

ESTIMATE OF DEVELOPMENT COST							
PROJECT				COURSE			
Design and develop new high speed lathe to operate at range of 1,000 to 2,000 surface feet per minute to sell for \$25,000.				207			
				DATE	PREPARED	BY	
				11/10/52	JAR		
				DATE	REVIEWED	BY	
				11/10/52	RSP		
DIVISION	SUB-DIVISION	DESCRIPTION	MATERIAL COST	LABOR AND OVERHEAD	OTHER COST	TOTAL COST	
			Hours	Cost			
Research	100	High speed bearings at various loads	3,000	12,750	10,000	32,000	75,000
Design	200	Headstock	50	1,500	6,900	3,000	10,000
	210	Gearing	100	3,000	9,900	2,000	12,000
	220	Base	75	4,125	11,825	2,000	14,000
	230	Etc., etc.	250	15,075	55,750	6,000	64,000
Production	301	Headstock - Patterns	125	650	2,175	200	2,900
	302	- Tools, Jigs, Fixtures	750	1,945	6,250	200	7,300
	303	- Experimental Parts	1,250	500	1,500	200	3,000
	311	Gearing - Patterns	225	900	2,975	300	3,300
	312	- Tools, Jigs, Fixtures	1,245	1,480	4,850	400	6,900
	313	- Experimental Parts	975	500	1,925	300	3,000
	321	Etc., etc. - Patterns	4,275	24,200	64,625	3,000	86,400
	322	- Tools, Jigs, Fixtures	12,515	47,400	176,385	5,000	190,800
	323	- Experimental Parts	18,280	6,650	45,780	1,500	55,800
	-222						
Testing	900		1,200	5,400	16,800	5,000	25,000
Grand total estimated cost			44,855	134,165	485,945	44,200	\$75,000
Total quantity of machines							5,000
Estimated cost per machine			9		97	9	115

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

Estimating Forms

Estimating forms like those shown serve to summarize estimates. Generally each item on an estimate sheet is the sum of a number of smaller items. A suitable form is a necessary tool when an appreciable number of estimates is to be made. It provides a concise and uniform means for presenting the results of an estimate to others and for preserving information for future reference. A well-balanced form helps to systematize the work of the estimator.

Estimating Direct Labor Costs

The total direct labor required for a job may be estimated by comparison with one or more similar jobs. For more detail, the work is divided into operations. That is the same as prescribing the method for the job and must be done competently if the estimate is to be verified by actual performance. If the estimator lists the operations, and many do, he must be well acquainted with the processes and methods involved. That may require specialized knowledge for various kinds of projects; a knowledge of toolmaking for estimating tools; of job-shop methods for small lot production;

or high-production methods for a quantity output.

The basis for estimating the time required for an operation is previous performance on similar operations. Many estimators with a background of years of experience as toolmakers, mechanics, foremen, etc., are able to judge operation times closely. Much tool estimating is done in this way, like that exemplified in Fig. 2, and even some product estimating.

Only a person with considerable background in the shop is competent to judge operations times with reasonable accuracy. Others need to refer to recorded experience. An estimator may go to the records in the cost-accounting department to find the time for specific operations that have been performed. These are entries of timecard readings that have been received from the shop. The cost department in one plant enters the actual operation times in the right-hand column of a copy of the estimate sheet in Fig. 4A. These sheets are filed by the estimating department and used as ref.

(C)-FINAL ASSEMBLY

PATTERN NUMBER		PART NAME		PART NUMBER		STANDARD COST		ESTIMATE	
MASTER STOCK		ASSEMBLY		UNIT		101/146		11/1/46	
ORDER QUANTITY	MATERIAL NUMBER	SIZE	LENGTH	LOS	PRICE	MATERIAL TOTAL COST	LABOR TOTAL COST	RATIO	POTENTIAL HIGH
10	8101	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	5110	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8019	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7913	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8014	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8102	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8017	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8018	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8016	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8015	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8013	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8012	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8011	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8010	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8009	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8008	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8007	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8006	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8005	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8004	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8003	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8002	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	8001	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7912	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7911	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7910	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7909	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7908	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7907	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7906	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7905	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7904	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7903	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7902	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7901	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7900	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7899	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7898	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7897	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7896	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7895	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7894	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7893	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7892	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7891	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7890	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7889	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7888	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7887	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7886	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7885	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7884	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7883	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7882	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7881	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7880	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7879	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7878	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7877	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7876	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7875	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7874	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7873	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7872	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7871	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7870	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7869	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7868	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7867	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7866	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7865	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7864	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7863	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7862	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7861	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7860	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7859	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7858	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7857	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7856	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7855	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7854	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7853	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7852	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7851	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7850	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7849	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7848	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7847	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7846	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7845	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7844	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7843	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7842	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7841	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7840	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7839	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7838	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7837	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7836	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7835	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7834	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7833	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7832	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7831	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7830	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7829	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7828	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7827	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7826	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7825	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7824	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7823	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7822	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7821	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7820	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7819	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7818	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7817	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7816	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7815	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7814	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7813	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7812	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7811	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7810	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7809	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7808	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7807	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7806	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7805	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7804	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7803	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7802	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7801	1/2	10	1	15.75	15.75	15.75	1.00	15.75
10	7800	1/2	10	1					

(B)-SUB-ASSEMBLY

PATTERN NUMBER		PART NAME		PART NUMBER		STANDARD COST		ESTIMATE	
		HEADSTOCK SUB-ASSEMBLY		TOTAL HEIGHT OR LENGTH		10/1/46		11/1/46	
ORDER QUANTITY	MATERIAL SYMBOL	SIZE	LENGTH	TOTAL HEIGHT OR LENGTH	UNIT PRICE	MATERIAL AL	LABOR OVERHEADS (EST.)	RATIO	MATERIAL AL
10	19882	HEADSTOCK BRACE				23	63	26	46
10	15175	SHAFT PIN JOINTION							25
10	13121	OIL GAGE HOUSING							25
10	13242	OIL GAGE HOUSING							27
ESTIMATE TOTAL						TOTAL	10	09	43
SET UP	CYCLE	DEPARTMENT WORK CENTER MACHINE TOOL	SPEC. NO.	DESCRIPTION OF OPERATION	RATE				
06	1 38	181-01	5	DRILL ALL MACHINED EDGES TOP ENDS AND SIDES OF HEAD REAM, SCRAPE BAND SAMS BEARING HOLES AND FIT BEARING HOLES	2 70	3	74	78	91
16	3 72		2	TO LONG AND SHORT INT SHAFT HOLES AND PULLEY SHAFT HOLES REAM AND FIT BRASS. PLACE BRASS DRILL AND					
			3	PLACE SET SCREW DRILL OR AND/OR DRAIN HOLES TO SPINDLE NUTS BRASS CLUTCH SHIFTER SHAFT HOLES AND MOUNT					
			4	SHIFTER SHAFT HOLE IN GROOVE SPINDLE HOLES, TAP HOLES, INSERT CONNECTIONS, LOCATE DRILL, TAP AND					
			5	BOLT OIL TUBE JOINTION TO HEAD DRILL AND WIRE SCREW PLACE OIL GAGE HOUSING, DRILL, TAP					
			6	AND REMOVE.					
			7						
			8						
			9						
			10						
			11						
			12						
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(A)-PART

PATTERN NUMBER		PART NAME		
# 19252		HEADSTOCK		
CHUCKER QUANTITY		MATERIAL SYMBOL	SIZE	LENGTH
10		C. L.		
ROUTING				
STOCK				
STOCK				
STOCK				
SET-UP	CYCLE	DEPARTMENT WORK CENTER MACHINE TOOL	DRY NO.	DESCRIPTION OF OPER.
19	02	103-01	05	
64	2 11			
18	06	103-02	2 10	
30	2 20			
43	48	111-04	3 15	
1 37	1 44			
78	40	111-04	4 20	
2 49	1 53	142	X	
76	30	140-03	5 25	
78	84	207		
82	1 01	111-07	6 30	
2 83	3 43	171	X	
06	40	180-01	7 35	
17	1 12			
19	1 27	141-03	8 40	
76	5 08	"	X	
1 07	1 08	140-05	9 45	
3 21	5 44	210	X	
32	38	111-07	10 30	
1 04	1 21		X	
29	14	111-09	11 35	
97	45		X	
			72	
			13	
10	11 23 03			
X 366 TOTAL 41878				TOTAL
				TOTAL MANU.
				ADMINISTRATIVE
				ENGINEERING
				GRAND

Fig. 6. In compiling the costs for a major unit of a product, the charts shown here can be utilized to collect the parts costs and the sub-assembly costs which are added to the final assembly costs.

TABLE I—TIME VALUES FOR MILLING AND GRINDING PUNCH AND DIE PARTS*.

Oil Hardening Tool Steel					
Dimensions		Milling 6 Faces	Grinding 2 Faces	Grinding 4 Edges	Total Milling and Grinding
Thickness Inches	Max. Area Sq. In.	Time in Hours			
0.5	4	0.500	0.250	0.250	1.000
1.0	4	0.500	0.250	0.250	1.000
1.0	25	0.750	0.250	0.500	1.500
1.0	40	1.000	0.250	0.750	2.000
1.0	60	1.250	0.500	0.750	2.500
2.0	4	0.500	0.250	0.250	1.000
2.0	15	0.750	0.250	0.500	1.500
2.0	25	1.250	0.250	0.500	1.750
2.0	45	1.500	0.250	0.750	2.500

NOTE: 1. Add 50 percent of above values for less than two pieces on same job.
2. These figures are based on $\frac{1}{8}$ cut max.
3. For high carbon—high chrome steel use 125 percent of above values.
4. For cold-rolled steel or machine steel use 70 percent of indicated values.

USE OF CHART:
1. Determine thickness of stock to be machined.
2. Multiply length by width to obtain surface area.
3. Select thickness, area and read time required for specific machining operation.
4. Transfer reading on Break Down Sheet for Plant Control.
5. For quick estimate use last column which gives total time for squaring up.
6. The figures include set-up time.

* "Standard Data for Tool and Die Cost Estimates" from George S. Clark's "Postdesign Estimating," *The Tool Engineer*, November, 1949, Vol. XXIII, No. 5, p. 27.

ferences for ascertaining the operation times on similar jobs in the future.

Table I shows a typical chart for tool estimating, compiled from carefully studied shop records. The ways the times for particular operations vary with significant differences in workpiece, size, stock removal, and material are easily ascertained. An accurate comparison is possible because the conditions applicable to an operation under consideration can be picked out readily.

When cost accounting or shop records are used as a basis for direct comparison or to make tables, care must be taken that the information is reliable. Time may have been lost by breakdowns or delays, and more time shown by the operator than actually needed for an operation. Sometimes care is not taken to punch in or out for a definite job, but time for one job may be carried over into others. An operator may be inexperienced or special tools may not be available for the first run of an operation.

Standardization of work methods has not been undertaken in many toolrooms and job shops because of the varied nature of the work done and the skill of the workers. Under such circumstances, operation time is estimated on an overall basis in one of the ways just described. Breakdown of operations for estimating purposes is not helpful without assurance that the selected routine and pace will be followed in the shop.

Almost all fabrication operations can be divided into set-up time and cycle time. Common practice is to establish set-up time standards for ordinary

operations. In other cases, set-up time can be derived from a study of the elements or steps required to make the set-up. An example of set-up elements is given in Fig. 8A. The set-up time is normally applied once to each lot of pieces, but for estimating purposes may be prorated among the pieces in a lot to obtain a unit set-up cost. A prorated unit set-up cost applies for only one lot size and must be clearly indicated as such so that the figures are not used for other jobs with possible erroneous results.

Cycle time is expended on each piece after the set-up has been made and consists of man or handling time, machine time, and down or lost time.

Machine time includes one or more elements of machine activity. A machine tool normally operates at a uniform set rate, and the time it takes for a cut can be calculated readily from its speed and feed. Where work is standardized, proper speeds and feeds are usually prescribed.

Man or handling time covers the work of the operator when the machine is not in action. It includes such elements as loading and unloading, clamping and cleaning off chips, evaluated by time study techniques. Various forms are in use to record the time study data. An example of the form found in one plant is given in Fig. 8B. This form is arranged so that the elements applicable for any specific case can be selected and totaled on the sheet. Space is also provided for calculating machine elements. Sheets like these are used for computing operation times for long run jobs in the manner described for Figs. 4A and B. For highly repetitive work in large volume man time elements may be basic motions.

Provisions must be made for lapses of time not included in the elements of an operation. These are taken care of by allowances for such justifiable and reoccurring items as personal needs, fatigue and other chores. The amounts of the allowances vary from plant to plant depending upon conditions and are determined by time study.

No overall or synthesized estimates of an operation can predict actual performance with certainty. Time may be lost from breakdowns, parts that do not fit as expected, tools that do not cut properly, defective material and other faults. Just what the lost time may be for a specific operation is impossible to predict. The best that can be done is to multiply all operation estimates by a performance factor to compensate for losses over a period of time. A performance factor may be derived by dividing the sum of actual times for a large number of jobs by the sum of the estimated times for the same jobs. This factor should be checked from time to time. The "estimating contingency" of Fig. 4B and the "estimate ratios" are performance factors.

(Continued next month)

Contour Milling Aircraft Skins

from Rolled Aluminum Stock

By Jesse Daugherty

CONSULTANT

GIDDINGS & LEWIS MACHINE TOOL COMPANY

AIRCRAFT SKINS comprise the exterior surfaces of an airplane and include such compounds as the fuselage, wing, empennage (tail), and the control surfaces, including ailerons, rudder and flaps. The exterior shapes of these surfaces combine to make up the aero-dynamic form and hold those subtle secrets of design which give high performance to modern airplanes.

Contour milling of aircraft skins is generally divided into classes, each of which requires a different cutter arrangement and machine control. The material used in the operations discussed here is rolled high tensile aluminum sheet, grades 24ST and 75ST.

The first class to be considered is the tapered sheet. See Fig. 1. This is produced by face milling a parallel rolled sheet to reduce it to a tapered configuration. The tapers may be compounded to suit particular load requirements. A variation of the tapered sheet is sometimes called a tailored sheet (Fig. 1), in which the taper is interrupted by pads or islands and a heavier parallel margin may be allowed for attaching purposes. The tapered skin panel usually is reinforced by riveting surface stiffeners or small ribs to the skin.

A second and later development is the integrally stiffened skin panel. In this panel (Fig. 1), the surface stiffeners, ribs and attaching and mounting points are accurately machined from a single parallel rolled sheet. Usually several types of cutting operations such as face milling, profiling with formed cutters and gang slotting operations are required. A further variation of this sheet is the egg crate or waffle pattern in which the ribs run in both chordal and spanwise direction.

Reasons for Machined Aircraft Skins

Machined aircraft skins offer many advantages in aircraft construction, the chief being greatest structural efficiency, or the maximum strength with mini-

mum weight. The speeds and loadings to which aircraft surfaces are subjected have greatly increased. Local stiffening of the surfaces must be greater to retain aerodynamic shape under higher loads. Higher shear and bending loads result from generally higher surface loads. At the same time wings are thinner, reducing the depth of spars possible. The result has been the stressed skin design where a large portion of the load is carried in the skin itself. Thus, the use of machined skins which can be made of just the correct configuration at each point to carry the load required fulfills these demands.

Other objectives in the use of machined skins are reduction of costs, reduction of man-hours and

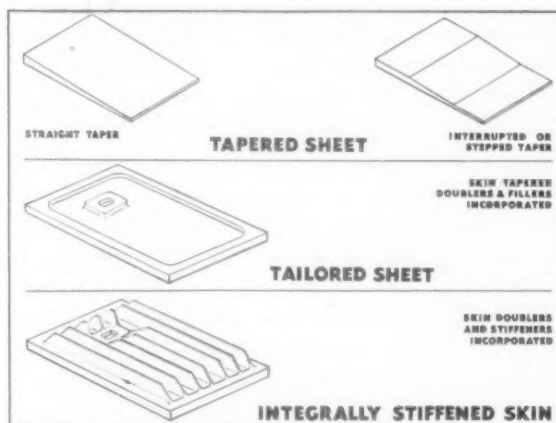


Fig. 1. The sheets used for milling aircraft skins are usually of one of the three types shown here.

a change in aircraft construction from the craft type of manufacture to one more suitable for mass production. This puts more intelligence into the machine and requires less handwork.

Another worthwhile result is the reduction in sealing required. A lot of surface panels are part of a fuel tank and all openings through the skin must be sealed to make the surface fuel-tight. The reduction of joints and rivets greatly reduces the area to be sealed.

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

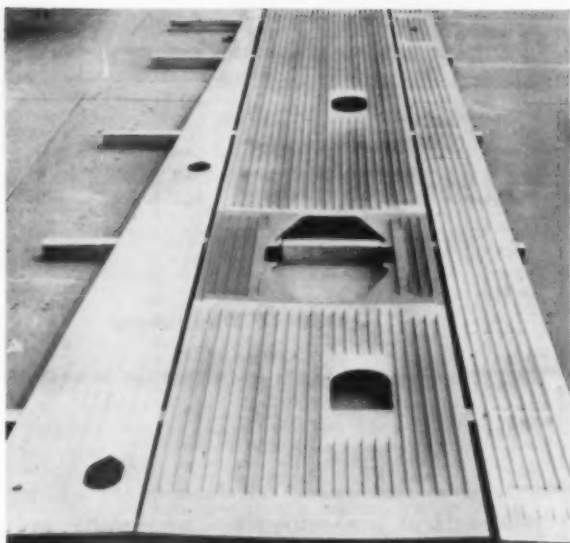


Fig. 2. This lower inner wing panel for a Super Constellation weighs 3300 lb in the original plate and about 390 lb when finished.

Machines for Milling Aircraft Skins

Machined skin panels were first used on the North American F-86 (Sabre) fighter plane in 1946. These were primarily tapered skins or tailored skins. The integral ribbed panel was experimentally developed by Lockheed Aircraft Corporation for the F-90 fighter which was never put into production. This type of panel is now used in the Lockheed F-94 and the Super Constellation. The Boeing B-47 and B-52 use taper rolled sheets with some machining on attaching and splicing areas. Most other military aircraft have some machined skins and guided missiles have some elements machined from plate stock.

The original milled aircraft skins were machined on converted metal planers and spar millers, and many of these machines are in use today. While the converted planers and spar millers had done a good job in the prototype and low-production stage of aircraft skin machining, new machine tools were needed if the sculptured skins were to be used generally in high-production aircraft manufacture.

The first requirement of such a tool is a large work area. A lot of the advantages of machined skins would be lost if the panels were made in too small a section. Second, the machine must have extreme accuracy. Skin thickness must be held within a few thousandths of an inch if the goal of ideal section is to be reached. The finish requirements are also fairly high. Third, the machine must have high cutting speeds and large amounts of power supplied to the motors driving the cutting tools. There is apparently no limit to the surface speeds which can be used when cutting aluminum with carbide tools, except safety to the operator. The heavy integral ribbed sheets require conversion of tremendous quantities of high-strength aluminum

to chips. The lower inner wing panel on the Super Constellation (Fig. 2) weighs 3300 lb in the original plate and about 390 lb when finished. The F-94 leading edge panel loses about the same percentage of metal.

Fourth, the machine must have high feed rates to go with the high cutting speeds and to cover the large areas to be machined. Fifth, the machine must have controls to permit milling angular paths in a horizontal plane.

Practically all panels have straight line angular sides. This is especially true of panels for planes with swept-back wings. Some form of 360-deg profiling in a horizontal plane is desirable, although cut-outs and curved outlines are usually made more economically on power routers. An accurate automatic profiling control in the direction of sheet thickness is essential for integrally ribbed skin panels.

Several new machine tools designed specifically for milling aircraft skins are now coming into general use. Among these are the Cincinnati Milling Machine Company's horizontal Hydro-Tel, the Onsrud Company's Invomill and the Giddings & Lewis Hypro aircraft skin miller.

The Cincinnati horizontal Hydro-Tel (Fig. 3) holds the sheet in a vertical position and easily

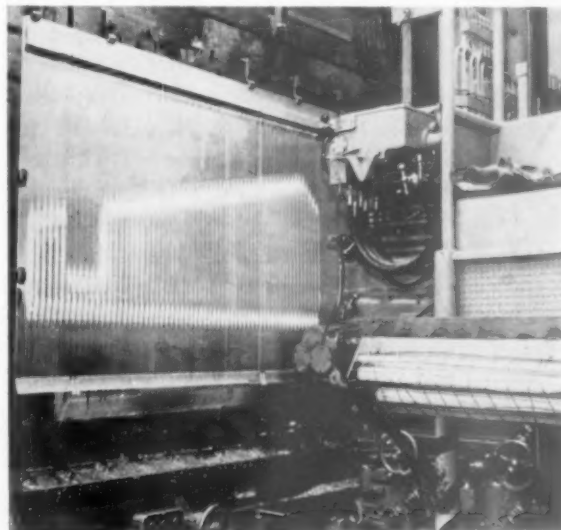


Fig. 3. When the sheet is held in a vertical position as shown here, the chip removal problem is easily solved.

solves the problem of chip disposal. The machine has a moving table and stationary column. It is equipped with three-dimensional hydraulic tracer control, the templet being mounted above the workpiece. The work area is 6 x 18 ft, and this is about the practical vertical limit of this type of machine.

The machine has high spindle speeds and feed rates and is equipped with a high-speed right-angle attachment for straddle milling the integral ribs.

Most of the experimental and prototype integral ribbed skins were milled on this machine.

The Onsrud A-72 Invomill (Fig. 4) was designed and built especially to machine skins and structures as required in high-speed jet-propelled aircraft. Self-reinforced skins are much thicker than built-up panels, so that quantity production of aircraft demands something much faster than the hand feed router, the power of which is too limited and feeds too slow.

The Invomill is equipped with a 30-hp, 15000-rpm motor and will rout or pierce panels up to 2 in. thick. It is power-fed and guided to a templet. The

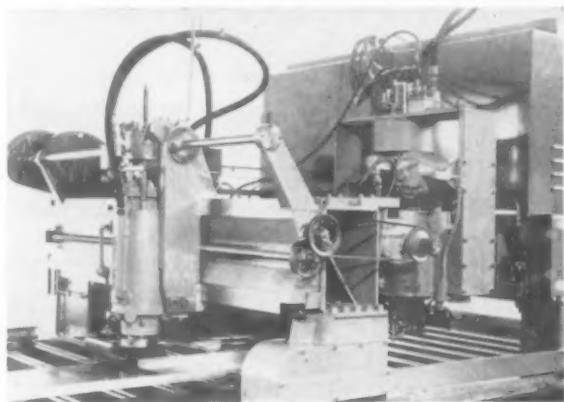


Fig. 4. This Onsrud A-72 Invomill was designed and built specifically to machine skins and structures required for jet aircraft.

templet is mounted over the workpiece very similar to hand routing practice. The follower is mechanical and might be described as a spring-loaded router arm with power translation and positioning to cover the required area. The head and carriage are driven by electric motors under amplidyne control, but accuracy does not depend on power following. The cam roller follows the templet under spring loading. A skin milling attachment is provided, comprising a separate head mounted on a tilting rail to provide transverse taper. The head is mounted on a vertical slide with geared connection to the carriage travel mechanism, providing tapers parallel to the carriage travel. This machine is primarily a power router.

It seemed that a large planer-type miller would best meet the requirements for aircraft skin milling, and particularly one with independent infinitely variable drive to table and heads. The Giddings & Lewis planer miller, with the Hypro-electronic feed drive to heads and table formed the basis of an aircraft machine tool.

In 1948, two machines were built for North American Aviation by the Cincinnati Planer Company (now the Giddings & Lewis Machine Tool Company). These were 66-in. by 20-ft machines with high-speed vertical spindles. In 1949, two larger machines, 96 in. by 30 ft, were furnished to



Fig. 5. This planer miller type machine was built by Giddings & Lewis and has a work area of 10 x 34 feet.

Boeing Aircraft Company, Wichita, Kansas, for the B-47 program. These machines were equipped with two vertical spindles (Onsrud 60-hp, 3600 rpm water-cooled heads or motors). Twelve-inch diameter, two-bladed face milling cutters are generally used on these machines. Cutting speeds are about 10,000 fpm. By proper setting of the table and head feed rheostats, angles can be milled to an accuracy of five minutes.

Automatic profiling was not available to meet the delivery required for these machines, but a visual form of following called the "scope follower" met the problem. The skin thickness or taper is effected by tilting the work-holding (vacuum) chuck.

In the meantime, the Lockheed Corporation was experimenting with integral ribbed skin panels. A design to machine the panel in a vertical position seemed advisable from the chip control problem. A machine holding the workpiece in a horizontal plane was best from a point of loading and holding the workpiece.

In 1950, a planer miller type machine was ordered from Giddings & Lewis (Fig. 5), with a work area of 10 ft wide by 34 ft long. Three 100-hp heads with infinitely variable spindle speeds were specified. Horizontal spindle attachments carrying 12-ft wide slotting cutter gangs were provided. Two separate automatic profiling systems were specified, one 360 deg in a horizontal plane, the other a single-dimension follower in a vertical plane.

The work is held on a large tilting vacuum chuck (Fig. 6). The chuck is actually a number of surface plates with pipe connections, uniformly spaced on the surface, to a vacuum pump. This machine chuck has four sections 10 ft wide by 8½ ft long. Each section is mounted on four adjustable posts. Experimental parts can be milled by sealing the sheet outline with a right-angle rubber extrusion. Seals may be set in grooves for production parts. A good plan is to use a project plate on top of the vacuum plate. The project plate is made of the correct size and carries the taper and pattern of

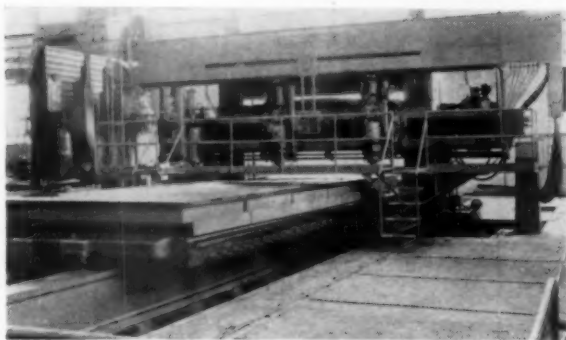
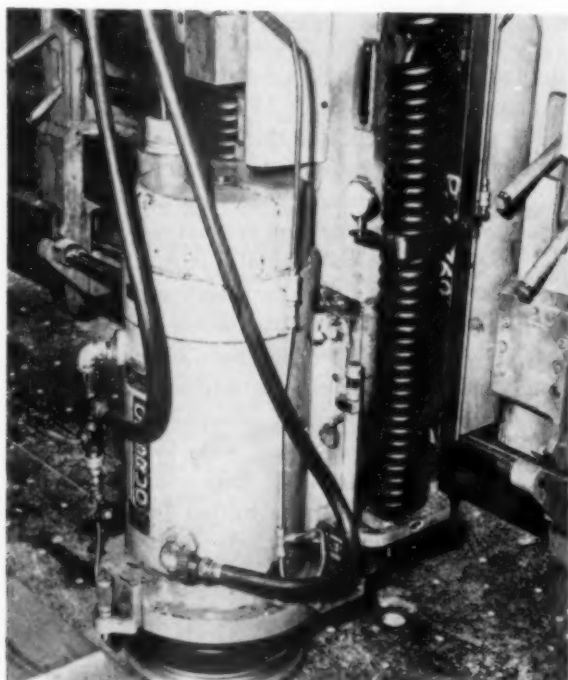


Fig. 6. The work is held by a vacuum chuck which has four sections 10 ft. wide, 8½ ft. long.

seal grooves for a particular part. Face milling cutters (Fig. 7), slotting cutters (Fig. 8), and profile milling cutters are used.

In general, the face milling cutters used are two-bladed, one blade being a rougher, and set radially ahead of the other. The finishing blade is set axially ahead of the rougher. Special cutter bodies comprising the rotor of a centrifugal fan are used. Together with an involute-shaped hood, this provides a chip pickup and the chips can be discharged through a pipe into a hopper. Finishes of 100 microinches or better are obtained at cut depths of ¾ in. and feed rates up to 120 fpm. Eight-inch diameter, two-bladed interlocking slotting cutters are used. Blades are angular for best finish requirements. Cuts have been made 4 in. wide and 1 in. deep at feed rates of 50 inches per minute with good accuracy and finish. Positive

Fig. 7. Face milling cutters used on the machine shown in Fig. 5 generally are two bladed. Finishes of 100 microinches or better are obtained.



rakes are used, about 10 to 15 deg. Metal removal is about 3 cubic inches per horsepower per minute. All cuts are made by climb or down milling.

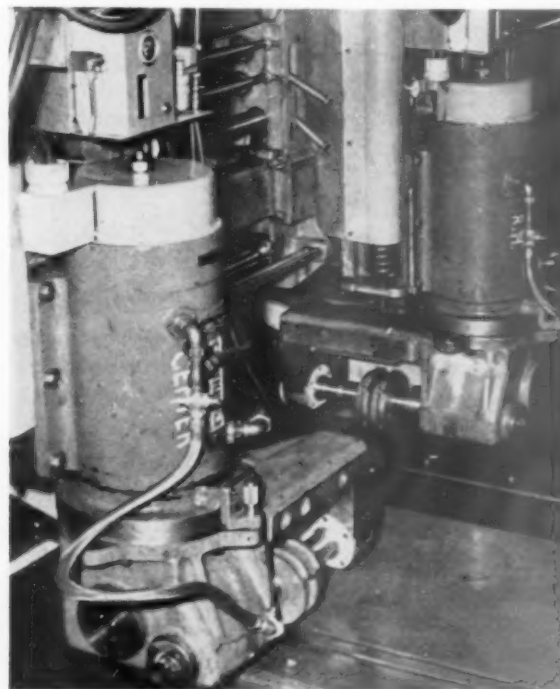
Complete costs of integral ribbed panels are not available, but preliminary studies show savings over built-up assemblies.

In general, both the airframe manufacturer and the Air Material Command have resisted milled skin panels. This is especially true of the integrally ribbed panel, where up to 90 percent of the original plate is converted into chips. Rolled tapered sheets, rolled ribbed sheets and extruded ribbed sheets are being developed. Some planning is under way to produce forged integral ribbed skins. None of these produce the flexibility, accuracy and finish of milled panels.

In the meantime, plans are under way to still further improve the skin milling equipment, possibly with some automatic or semi-automatic features. The machining goes very fast, almost like wood cutting, but the tool setting, cam changing and measuring consume many times the cutting time. The large Constellation panel requires several hundred cam changes. An automatic machine would reduce the time for idle motions and reduce the chance of operator error.

Contoured or sculptured skin panels are only part of the revolution going on in building airplanes. New tools are needed to machine many other elements such as spars, struts, ribs, hinges and bulkheads. When the large press program is completed, new machines will be needed to finish aluminum forgings of many shapes and sizes.

Fig. 8. The two-bladed slotting cutters are eight in. in diameter and remove about three cu in. of metal per horsepower per minute.



Duplicating Jet Engine And Compressor Blades

PRODUCTION OF compressor and turbine blades for jet aircraft on a mass basis has been one of the toughest problems in the current drive for rearmament. These blades must be machined to close tolerances and no deviations are permitted. Therefore, the emphasis has been on highly skilled machinists working on a piece work formula. Considerable research and development work has been devoted to this problem by several producers, and one of the results is the abrasive belt grinder developed by Pratt & Whitney in cooperation with the Minnesota Mining and Manufacturing Co.

Operating on the duplicating principle and using high speed abrasive belts for precision stock removal, this machine has gained wide attention in the jet engine field. Furthermore, the principle involved holds considerable promise of new economies and efficiencies in the metalworking field.

In production tests on 12 percent chrome steel jet blades, the machine was found to do these things: Reduce tolerances from 0.010 in. by other methods to 0.003 in. by the precision grinding method; cut production time from as much as 30 minutes per blade by hand precision grinding to a small fraction of this time. One operator can tend six machines, resulting in high production.

Since the trend in jet engine design is toward the more powerful, many-bladed, axial flow compressor, rather than the one-piece, centrifugal compressor previously used, new emphasis has been placed on production of jet blades.

Experience with this blade grinder has proved that abrasive belt precision grinding offers a practical solution for economically producing highly accurate blades. Belt grinding is used as the method of stock removal for these reasons: A precision grinding surface is maintained by quick change abrasive belts, and thus an efficient economical cutting surface is always available; contact wheels of small diameter that back up the belt can be used to grind concave surfaces with radii of as little as 5/16

in.; cooler cutting, as a result of long belts, prevents distortion when grinding thin airfoils of the metal blades; constant wheel diameter is maintained for precision work because the abrasive belt, not the contact wheel, wears away.

Finishing jet blades to close tolerances on a mass production basis has been a difficult job. An accurate airfoil contour within 0.003 in., and a surface finish of 10 microinches rms has been the goal of the engine manufacturers. However, in the past this has not been practical on a volume basis.

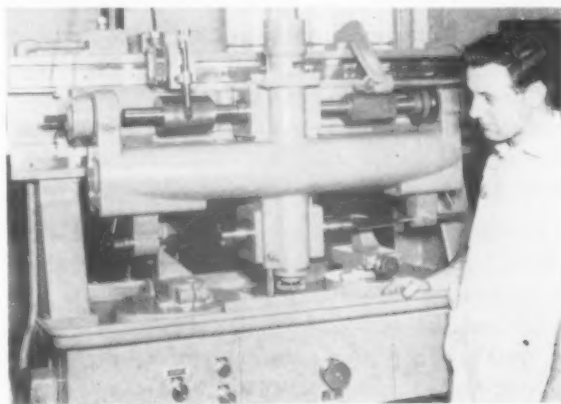


Fig. 1. Close-up view of the traversing work frame showing cams and followers with the work piece at left and the master model at right.

In achieving this goal, the belt-equipped grinder finishes to size and polishes all surfaces, including the leading and trailing edges, automatically. Irregular and twisted airfoil sections of both turbine and compressor blades can be ground.

In addition, it achieves a higher degree of accuracy than is possible by existing production line methods, and is believed to be considerably faster than any other method of blade finishing now used.

This automatic machine operates on the duplicating principle. The profile is generated by a

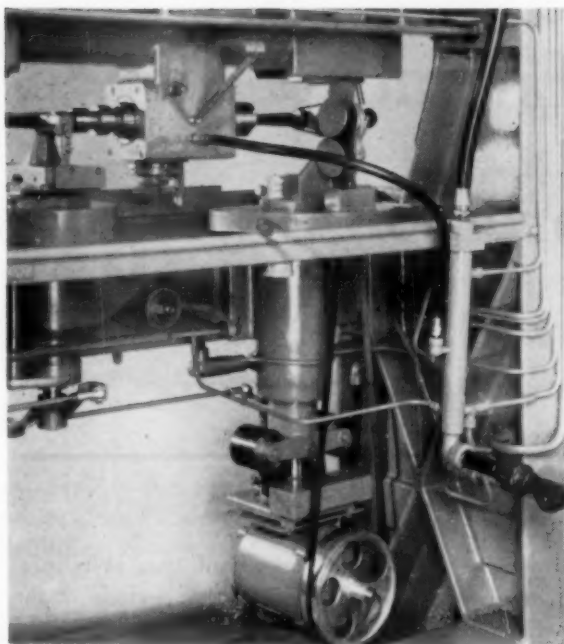


Fig. 2. The electric motor for the abrasive belt is shown here at the bottom. At the upper left is the master model follower.

pattern, or master blade, while stock removal is accomplished by the high-speed abrasive belt.

However, two new motions have been added to the machine for precision grinding and finishing of straight or twisted airfoil shapes. A sweep, or swiveling, motion of the abrasive belt grinding head eliminates any tendency toward steps or waviness on the critical surfaces of the blade. A compound feed motion enables the machine to grind close to root areas of blades which are raked, or swept back, from their base.

This machine is composed of two main assemblies, a main frame and a traversing work frame operated by a hydraulic cylinder. Suspended from the top of the machine is a traversing work frame. Cams on the work frame operate non-traversing cam followers which are mounted along the top of the main frame. Mounted on the power part of the main frame are the master cam follower, the abrasive belt grinding unit, and linkages and operating controls.

As the work frame traverses, it swings fore and aft against the fixed master cam follower. The work frame consists of four synchronized stations. The master cam, which is actually a master blade with an envelope, is the lower right station, while the work-piece is in the lower left station.

The pattern blade and the work-piece rotate simultaneously, powered by a variable speed hydraulic motor mounted on top the work frame. The rotation of the master cam against its follower moves the hinged work frame fore and aft. The action of the master cam against its follower is

duplicated by the action of the work-piece against the abrasive belt on its contact wheel.

The master cam follower and the abrasive belt grinding unit swivel in unison to make the cutting surface parallel to the surface of the blade. This sweep action is induced by linkage with a sweep cam mounted in the upper right lathe station on the hinge axis of the work frame.

At the right end of the sweep cam is the compounding feed cam. When the root area of a raked blade reaches the abrasive belt, the compounding came goes into action and causes the work frame to traverse back and forth in a short shuttling action to grind the triangular root area without hitting the base of the blade.

For grinding ordinary blades that are perpendicular to their base, the compounding feed cam is not used. In the upper left station, also on the hinge axis of the work frame, is a velocity cam. This causes the work-piece to rotate at a speed so as to maintain a reasonable constant speed of the grinding.

The ratio between the high and low speeds of rotation is 10:1. This makes it possible to speed the time of the overall grinding cycle. A hydraulic oil supply operates the traverse cylinder and the variable speed lathe motor. Where several machines are operated, a large hydraulic unit may be used to operate all of them.

The machine is versatile, capable of handling blades of all designs up to nine inches long. A wide variety of contact wheels and abrasive belts makes possible not only precision grinding of milled blades, but also polishing of precision cast and precision forged blades.

Fig. 3. The top blade shown here has not yet been ground or polished. The lower blade has been finished on the automatic grinder.



Shell Molding

by the Croning Process

By Richard Herold

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SHELL MOLDING, or the C process as it was originally called, has advanced within the United States at a tremendous rate, despite secrecy, lack of ready designed equipment, and a confused and misleading patent situation. It is probably safe to say that most production foundries are either engaged in an evaluation of the technique, or actually producing on a pilot plant scale or better. Many jobbing foundries are now finding it profitable to adopt the shell molding technique for their uses. Foundrymen who, just a few months ago, would have nothing to do with shell molding are now rushing to make up for lost time.

It is understandable that, with the passing of time, a considerable fund of know-how and greater familiarity with the process has been acquired. In addition, there are also better resins and a wider variety of equipment designs available.

As far as is known, there were only three foundries actively involved in shell molding production a year ago. There are now at least twenty-three so engaged, which, under the handicaps involved, is an advance.

Shell molding is now used for automotive parts formerly fabricated, forged or cast by conventional methods; railroad castings; radiation and boiler sections; aviation castings; plumbing fittings; pressure pipe; kitchen equipment; water pumps; electrical fittings; diesel castings; marine castings; hand tools; home utility items; fractional-horsepower electric motor housings.

Purpose of the Process

The shell molding technique reportedly accomplishes the following desirable aims: (1) brings to the foundry industry a method of precision casting at conventional sand casting costs, (2) reduces machining operations because of far greater casting accuracy, (3) reduces sand handling, (4) elimination of much sand-handling equipment, (5) pos-

sibility of using unskilled and female labor, (6) smaller factory space requirements, (7) savings in metal because of more accurate casting and reduced finish machining, (8) increases yield—small sprue, runners and risers, (9) increases production, (10) makes the foundry a clean and pleasant place in which to work.

Castings to a tolerance of 0.002 to 0.003 inch per inch are claimed for this technique, and castings produced within 0.001 inch per inch specification have been observed. This one camshaft casting, as an example, is within 0.012 in. of specification along the length and 0.007 in. across the parting line.

It is probably fair to assume that the general technique of making shell molds by means of a dry mixture of phenolic resin and sand on a lubricated, heated pattern is sufficiently well-known to tool engineers to permit passing over the rudimentary phases so as to get down to a discussion of more recent developments and problems.

Metals Suited to the Process

Experience to date indicates that shell molding is particularly well-suited to aluminum; grey, nodular and malleable iron; low-leaded low-tin bronzes; and high alloy steels. Limited work has been done on magnesium and encouraging results have been encountered in the incorporation of inhibitors in the resin sand mix at the muller so that they become a cured part of the shell. More work has still to be done in this particular field to justify conclusions. Whereas low-carbon steels originally presented some difficulties in that they failed to give the surface characteristics normally to be expected of shell molding, more recent work is encouraging in pointing the way to overcoming these apparent handicaps. Lead sweating of high-leaded bronzes continues to be a problem. Excellent work has been done in stainless steel.

The question of size limitations has always been pertinent in connection with shell molding. Previously 20 to 30 lb was considered an upper limit,

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but now castings in excess of 200 lb are in the making. There is no present justification for concluding that this represents the maximum in casting size. Unquestionably, ways and means will be found to push this limit upward.

Production Speed

Much has been learned since the publication in May, 1947 of FIAT Final Report No. 1168. Then, the reporters on the technique were talking of producing one mold per pattern in three to four minutes. They were using an oven curing temperature of 570 deg F. Now, the mold-making cycle can be accomplished in less than 30 seconds where temperatures of 1000 deg F for curing are available. Bear in mind this is an oven atmosphere temperature; the resin-sand mix should never reach 570 deg F, which is the charring point of phenolic resins.

Support Materials and Methods

Steel shot was originally cited as the preferred supporting material and continues to hold that preferred position. Sand and other coarser aggregates have been used for certain work with some degree of success. Surprisingly enough, good results have been encountered pouring certain lighter castings with no supporting medium whatsoever. A 45-deg grey iron "el" casting has been poured without support for its mold shell.

For stock-molding operations, as well as for holding shells unsupported by shot or similar materials, it is essential to have a mold assembly with parallel sides so that any pressure against the mold sides is evenly distributed. At least two methods of accomplishing this have been devised, one involving "striking off" the high points on the back of the semi-cured shell, and the other involving parallel grinding of similar high spots on a cured shell.

Whereas there were early hopes of controlling the rate of metal solidification by variation of supporting material, more recent experience indicates that the insulating qualities of the sand shell are such as to practically nullify the effect of any difference in thermal conductivity of the supporting medium. This same insulating effect makes it possible to pour at lower temperatures than common for similar castings in green sand and to successfully run thinner sections.

Heat Sources

While oil- and gas-fired ovens seem to have been of chief interest in the past, more interest is now devoted to the employment of electrical resistance heating units and to infrared lamps.

For the maintenance of uninterrupted production operations, it is necessary to control pattern temperatures at a constant and fixed figure. The heated pattern loses approximately 50 deg F on investment with room temperature sand. While some of the

heat of the curing application may be soaked up by the pattern to make up for this loss, it seems like a rather unreliable procedure, and resistance heaters are recommended for incorporation with the pattern itself to counteract this loss.

In addition to the use of resistance units as effective pattern heaters, there is now abundant evidence to verify the effectiveness of infrared heating devices of the metal rod type which give temperatures as high as 1200 deg F. These electrical devices can be thermostatically controlled and offer an inexpensive, flexible and highly efficient method of heating and curing.

Coring

With respect to coring, definite problems still confront the foundryman and remain to be solved.

Segregation of resin and sand, when mixed in the regular manner, results during any blowing application, since the resin, being lighter than the sand, has a tendency to pass through the mixture, leaving the sand grains without a bonding agent. A method of gaining adequate resin-sand distribution over all surfaces of complicated core boxes must be found.

While a wet or solvent process for coating sand grains has been developed, the system requires further refinement before it can be advocated for production employment.

More recent experience fully justifies the use of the conventional solid type of core bonded with either resin or core oil. This does not imply a sacrifice in accuracy, since the core print is rigid and the core is maintained in a fixed position during pouring. At least one exponent of shell molding has abandoned shell cores in favor of urea resin-bonded solid cores in the smaller sizes, from four inches down. Results are completely satisfactory in all respects—quality, finish, shakeout and cost. There are no dangers inherent in the use of a urea-bonded core in a phenol-bonded mold.

Mechanization

Whereas manual operation of equipment was widely practiced in Germany, the same technique would not be used in this country. Rather complete mechanization has necessarily been applied in the several different foundries now engaged in shell molding. Sufficient progress has already been made to suggest that pushbutton operation of mold-making equipment is not too far away. There are now approximately ten companies interested in the production of shell making machines.

It must be admitted that the cost of resin for this bonding process is not inconsequential. Shape and size of sand grain used, as well as clay content, will have a bearing on the amount of resin needed. The strength of the finished shell will likewise dictate the amount of resin and sand used. Any reduction in the amount of resin required is progress in the

right direction. Such a development has taken place. Whereas the process originally called for from 6 to 8 percent of resin by weight, good production work is now being done at resin levels varying between $3\frac{1}{2}$ and 6 percent. Costwise, this is very important.

Mold Assembly

Reference was made in the original publicity on shell molding to the joining of cope and drag sections by pasting. There is growing interest in this method on which development was arrested in this country while great impetus was given to the use of bolts and nuts, wire clamps and tape. It is believed that pasting will come into greater prominence. This belief is based on a knowledge of what has been done with synthetic resins in the wood-working industry. The same principles apply here, and the development of suitable rapid-setting adhesives may be anticipated. Such a method of joining shells will tend to prevent finning, make for a more rigid mold and a more accurate casting.

Pattern Metals

One of the questions invariably encountered pertains to the suitability of aluminum for patterns. Within certain limits, good results can be expected; however, its shortcomings must also be kept in mind. It is light and easily worked, but is subject to distortion, is easily damaged through misuse, and may lose its smoothness through etching from ammonia fumes given off during shell curing. Such a result has already been encountered in production practice. In addition to its other drawbacks, aluminum loses its heat quite rapidly.

While experience seems to indicate the desirability of using a polished grey iron pattern having a carbon content of 3.65, it is also known that satisfactory shells can be produced with almost any metal pattern. Actual production work is being done using a high copper content alloy.

It might be well to emphasize that, while the literature available speaks frequently of spring-loaded stripping pins, these are admittedly the source of temper loss and other difficulties. The advisability of working out a stripping mechanism not requiring springs is suggested as being entirely practical.

Patents

The present status of patents is interesting. As far as the author knows, there are now no patents in existence governing the use of shell molding. While it is reported that patents have been applied for, it is the writer's opinion that there are probably no grounds for the issuance of any broad patents which might further impede the employment of shell molding by the foundry industry. The fact that many of the largest production foundries are

going ahead with plans for shell molding would seem to indicate that their legal departments take the same attitude. Anyone considering using this new process should handle the matter with his own legal counsel.

Gating and Riser

Gating and risering are much less mysterious now than formerly. Smoother interior mold surfaces having a lower chilling rate make possible a reduction in gate and runner sizes. General experience indicates the advisability of using an ingate considerably smaller than would be required for conventional molding. A tapered down-gate will be easily kept full of molten metal and will prevent aspiration. Gates and runners, round in cross-section, will permit flow of molten metal with a minimum of surface friction and turbulence.

Pouring Temperature

Generally speaking, the insulating nature of the shell mold combined with the smoothness of its surface makes possible the use of pouring temperatures 150 to 200 deg F below conventional green sand pouring temperatures.

Trouble Shooting

Because of unfamiliarity with their use, many people have mishandled phenolic resins and have failed to secure expected results predicted by the manufacturer who assumed proper application. The following factors require close consideration:

Moisture. Except for the attainment of specific working qualities, it is quite important to avoid, as much as possible, any introduction of moisture. Containers of phenolic resin should be closed immediately upon withdrawing necessary supplies. Only that amount of resin should be withdrawn and mixed with sand which is necessary for the day's production. A mixture of resin and sand left to stand overnight will absorb moisture just as common table salt does. The presence of moisture in the resin-sand mixture will contribute greatly to a reduction in the strength of the mold shell.

Curing. Overcuring contributes to weakness and will result in soft and friable edges and surfaces, while undercuring contributes to lack of strength and distortion. Inadequate mixing results in lack of uniformity in shell structure and possible voids. Too fine sand has a similar tendency because of difficulty in securing thorough mixing. Resin-sand separation in reservoir has a similar effect.

Non-uniformity of Pattern Temperature. This will result in unsatisfactory shells, some undercured, some overcured and, possibly, some meeting production requirements.

Overburden. Insufficient resin-sand burden on pattern during the forming stage may result in voids

on the mold surface when the mixture has failed to fill in properly. The extent of the overburden required will vary with the complexity of the pattern; a minimum of four inches is suggested for laboratory evaluation purposes.

Excessive Shell Wall Thickness. For reasons not yet clearly known, casting surfaces become increasingly less satisfactory as the shell thickness increases beyond one-quarter inch. Aside from resulting rough surface characteristics, there is also a tendency toward excessive grain growth, which seems to be tied in with the insulating effect of the resin-sand mold shell. Some loss of permeability as a result of a thicker shell may have an effect on surface smoothness too.

Rim Build-up. For prevention of resin-sand

build-up at rim of dump box, use an oak flange or insulate the flange with either Teflon or silicone-impregnated glass-fiber laminate. Another method is to apply permanently a fixed metal gasket to the pattern plate. This gasket should be of steel, about $\frac{1}{8}$ inch thick and conform exactly in dimensions to the dump box mouth. It can be anchored to the pattern plate by two countersunk machine screws.

Gating. In developing proper gating, there has been a tendency to design the pattern ingate exceedingly small in size, with the idea of later filing the shell ingate as required to increase its size. Unfortunately, this has invariably proved disastrous, contributing always to a very rough surface condition. Any alteration in the mold ingate must first be incorporated in the pattern itself.

Cylindrical Grinding

(Continued from page 39)

3rd Operation: grind to specified finish size plus 0.000025 inch.

The grinding procedure in each operation was as follows: (1) Place the work between centers. (2) Move the wheel slide through wheel slide rapid travel to grinding position. (3) Start headstock and table movements. (4) Start grinding by hand crossfeed to positive stop. (5) With the exception of the first operation, which may be considered as a roughing grind, the operator should count the number of table reversals when grinding to assure the same number of grinding passes on each piece. During this time the operator measures the previously ground pieces, and prepares the next piece for grinding. When performing the third or final grinding operation, the wheel is fed by hand to the positive stop on the crossfeed handwheel at the point of table reversal, after which four or five passes of the wheel across the work are made, as the occasion requires, and the wheel slide is returned to the starting position by hand. The wheel slide rapid travel does not operate until the wheel is clear of the work surface. Rapid reversal of the wheel slide from the finish grinding position tends to mark the work surface. Although the mark may be distinguishable only to the eye of an expert, it would be quite objectionable.

It was learned that utmost care must be taken in cleaning a finished part preparatory to measuring. Nylon wiping cloths have proved very satisfactory; they leave a clean surface free from lint, and have good moisture absorption qualities. The slightest foreign matter on the finished surface may result in false measurement when working to such close limits.

For performing the final finish grind, controlled room temperature is very important. Steel expands

0.000006 inch per inch per deg F. When grinding to a total tolerance of 0.000025 inch it is obvious that a temperature variation of four or five deg would consume the major part of the allowable tolerance, thus increasing the attendant difficulties. It is advisable to run the entire machine for at least half an hour before grinding on the final finishing operation.

Given above is a step-by-step account of the preparation, practice, and demonstration of product grinding to extremely precise grinding specifications. It will be noted that even factors generally ignored as seemingly unimportant made their contribution to the final results which met the objective. However, it must be remembered that, for the machine to retain its superior grinding qualities, it must be handled with care. The accuracy of the machine can be destroyed by careless handling such as improper cleaning, or failing to keep the swivel table clean when changing the position of the headstock or footstock; by excessive clamping of the swivel table, thereby tending to cause distortion; by improper lubrication of movable members; or by general rough treatment of the machine. With proper consideration the machine will retain its grinding qualities indefinitely.

It is apparent that there is a very definite relation between stock removal in a given time and the resultant uniformity of size and surface qualities.

Results show that grinding provides the means of producing a high surface finish of full diameter over the entire surface to a tolerance of 25 millionths of an inch on cylindrical parts having grooves or other interruptions in the surface.

When grinding cylindrical parts to fractions of one ten-thousandth of an inch, it is necessary to provide means of precise adjustment of the swivel table as free as possible from the effects of the human element.

Simplifying Trigonometric Calculations

By William W. Johnson

WHEN DESIGNING or checking a jig or fixture for a simple or compound angle machining operation, the coordinate dimensions from a construction hole or ball (0) may be established either by solving a number of triangles (*The Tool Engineer*, December, 1950) or by using the method of rotation of axes described here. The method using rotation of axes is simpler and involves less calculations. The formulas from Fig. 1 are used to solve for x' and y' in Fig. 2.

$$\begin{aligned}x &= x' \cos \Theta - y' \sin \Theta \\y &= x' \sin \Theta + y' \cos \Theta \\x' &= x \cos \Theta + y \sin \Theta \\y' &= y \cos \Theta - x \sin \Theta\end{aligned}$$

Fig. 1. Find formulas for x' and y' here.

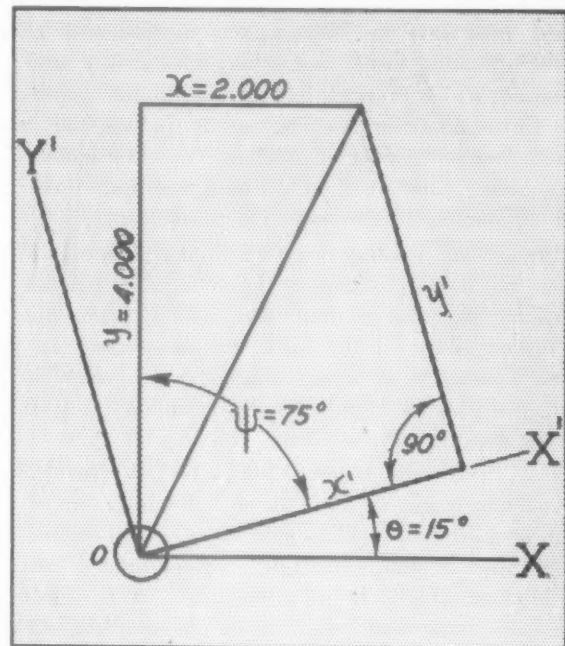
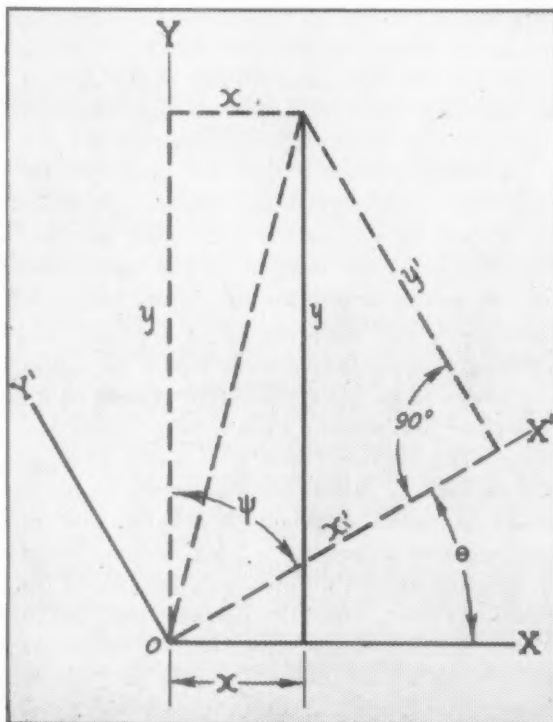


Fig. 2. Solve for x' and y' with these values.

$$\begin{aligned}x' &= x \sin \Psi + y \cos \Psi \\&= 2 \sin 75^\circ + 4 \cos 75^\circ \\&= 2(.96593) + 4(.25882) \\&= 1.93186 + 1.03528 \\x' &= 2.96714 \\y' &= y \sin \Psi - x \cos \Psi \\&= 4 \sin 75^\circ - 2 \cos 75^\circ \\&= 4(.96593) - 2(.25882) \\&= 3.86372 - 0.51764 \\y' &= 3.34608\end{aligned}$$

Strength of Bolted Assemblies

By John S. Davey

ASSISTANT GENERAL MANAGER OF SALES
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Part II

NEXT TO BE CONSIDERED are joints that are not rigid such as gasket joints, plastic material, aluminum, or other metals of low modulus. In the case of a steam chest, for instance, with a gasket separating the metal surfaces, the external loads are almost entirely added to the pre-load. Bolts in such joints must be selected to have strength enough to take the pre-load, plus whatever load is added. A steam chest must have the bolts tightened sufficiently to resist operating forces and to maintain gasket compression, which prevents leakage. While the operating forces do generate cycle loading, in this case it would not be frequent enough to cause fatigue or loosening. Some air cylinders used to vibrate foundry equipment present such bolt problems.

When cycle loading is present under such conditions, the bolt should be strong enough so that the pre-load, plus the external load, will be below the endurance limit of the bolt. In many cases the cycle loading is so severe that it is necessary to reduce the shank of the bolt below the stress area of the threads to relieve the critical section. It is well, in these cases, to use as long a bolt as possible. Frequently a soft ductile bolt is better than one of high proportional limit. In such cases, a heat treated bolt drawn at high temperature rather than a low carbon one might be recommended. It is often necessary under such conditions to use some locking device to prevent the nut from loosening.

It is again emphasized that the safety factor is always in the pre-loading of the bolt and nut, rather than in the strength of the bolt itself.

For example, the bucket of a piece of dirt removal equipment was always coming loose. The engineer kept increasing the size of bolt and the tensile strength until he finally had 1 1/4-in. alloy bolts heat-treated to 150,000 psi. The bucket was a steel casting and the arms were steel plates. The men in the field often welded the bolts which, of course, only caused additional damage. Finally, the com-

plaint came that the bolts cost too much and were too hard to get.

When the assembly was examined, the answer was obvious. The man assembling the unit was using a 3/4-in. impact wrench to tighten these bolts which would require 1,500 ft-lb of torque.

It was suggested that they go back to their original 3/4-in. bolt, put in 1038 heat-treated grade and set them up with 250 ft-lb torque. From recent reports, a bucket had been working for over two months with not a sign of the bolts loosening.

Still another example is a large 36-in. water gate valve designed to withstand 160 lb pressure. There were 48 one-in. bolts holding the bonnet on the valve, a gasket joint, and it could not be kept tight. The valve was put on, tested, and it would leak. The man running the test used a long wrench, put a long piece of pipe on it, and set the bolt up some more. It still leaked.

Back on the assembly floor, an operator was observed with a tremendous impact wrench setting up these bolts. Inquiry proved that they had a group of special, very large valves for one of the big dam jobs and had the wrench manufacturer build a wrench for 2-in. bolts. The operator was using it on 1-in. bolts, because it took less time than the smaller wrench. It might have taken less time to do what he was doing, but the bolts were stretched 1/2-in. Naturally, the solution was to tighten the bolts just enough to keep the valve from leaking.

That leads into the question of torquing and wrenching. Torque is admittedly one of the toughest questions to be faced. About 90 percent of the torque effort in tightening a nut is used to overcome friction. This friction factor is so easily changed that it is hard to predict just how much torque is necessary to tighten up a bolt. It is known that the torque required to produce a given tension in the bolt is equal to the torque coefficient, times the nominal diameter, times the bolt tension. And it has been determined that under normal conditions this coefficient is 0.2 (Table IV), which provides an easy empirical formula of torque in inch-lb as equal

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to 0.2 x bolt diameter x bolt load. But, what are normal conditions? They can be determined by setting up a pilot assembly.

One very definite way is to measure the actual elastic elongation of a bolt, using the fact that steel stretches 0.001 inch per inch of grip for each 30,000 psi tension, which can be quite difficult. It is possible to control the pre-load by the angle through which the nut turns, but that, likewise, is not easy. There are many torque wrenches on the market which, if calibrated correctly, will measure torque; but again proper torque must be determined to give the pre-load desired. One simple method is to set up an assembly, torque the bolt up to its yield, and then set the wrenches to about 75 percent of the torque.

Mechanical or power wrenches, properly handled, are the best methods. If they have throw-out clutches, they should be watched and checked frequently. If they are of the impact type, they should be of the proper size and the operator should be skilled. Good results have been observed from all these wrenches; on the other hand, many bolts have been severely damaged. Impacts, however slight, if carried on long enough, can cause metal breakdown by fatigue or excessive torques.

After the joint has been designed, the next problem is to select the bolts. A standard item is recommended, since specials are very expensive and hard to obtain. Moreover, if there is a field adjustment or repair problem, a special will be very practical. It is safest to go to ASA Standards for dimensions, and recently ASA have begun to set up product standards. Fastener manufacturers have catalogs showing stock items, and maintain an association, Industrial Fasteners Institute. ASTM publishes specifications covering the physical properties and SAE has also set up various physical grades.

The common fasteners are made of low-carbon steel, usually 1018. Such steels do not react to heat-treatment and, therefore, can be classed as approximately 55,000 psi. True, some are in excess of this because of various degrees of cold working, such as bright cap screws, but unless the size and details on the specific parts are known the design possibilities are limited.

Then, there is the 1038 heat-treated product, the properties of which are covered by ASTM 325 and SAE Grade 5. It is thought of as 125,000 psi, but the sizes above 5/8-in. are slightly below this figure. This is becoming the popular grade of fastener and, while it is as yet only made as a stock item in the hex head cap screw, it is being ordered as specials in the other types of bolts.

Some bolts are being produced from alloy steels to physicals of 150,000 psi, covered by SAE Grades 7 and 8, but it is a very expensive product and unless there is some very special engineering reason to offset its cost, it should not be specified.

TABLE IV—TORQUE COEFFICIENTS

Bolt Size	°Theoretical	Measured (average)	
		High-point torque	Mid-point torque
1/4 -20	0.210	0.243	0.267
1/4 -28	0.205	0.216	0.231
5/16 -18	0.210	0.206	0.186
5/16 -24	0.205	0.194	0.183
3/8 -16	0.204	0.200	0.247
3/8 -24	0.198	0.192	0.234
7/16 -14	0.205	0.217	0.224
7/16 -20	0.200	0.194	0.190
1/2 -13	0.201	0.205	0.158
1/2 -20	0.195	0.167	0.205
9/16 -12	0.198	0.194	0.214
9/16 -18	0.193	0.196	0.207
5/8 -11	0.199	0.178	0.196
5/8 -18	0.193	0.183	0.175
3/4 -10	0.194	0.169	0.172
3/4 -16	0.189	0.170	0.180
7/8 -9	0.194	0.181	0.194
7/8 -14	0.189	0.171	0.178
1 -8	0.193	0.188	0.204
1 -14	0.188	0.161	0.167
Average	0.198	0.191	0.201

*Computed with coefficient of friction of 0.15 and the dimensions of American Standard Regular Nuts.

The 1038 screw is really the most economical one to use if the joint is engineered to take advantage of its holding power. It offers more pounds pull per dollar than any other fastener. The common bolt offers more pieces per dollar if the problem is to fill holes.

In a joint, the load must be supported in the bolt. The bolt material will take it because it is heat-treated and was designed to do so, but soft material will not support the load. If it is necessary to use high-strength bolts, check the material under the head. This is true of rigid, as well as gasket joints.

There is one more very important element in the strength of a bolted joint—the thread. There are two classes of threads, coarse and fine. One of the few uses for the fine threads is on an adjustment screw or a bolt with a slotted nut and a cotter pin.

Certainly, a single thread series would simplify problems in the design end and would save money by simplified stock, and lower inventories of both fasteners and tools. One large manufacturing company making a wide range of products has adopted the coarse thread series with satisfactory results. If the single thread series is adopted, the designer is practically limited to coarse thread, because there are very few instances where fine threads can be tapped in castings.

There are some sound engineering reasons why the coarse thread is better than the fine. Professor Buckingham at the Massachusetts Institute of Technology proved that the stress distribution in the nut (Fig. 6) having coarse threads varies from 53 percent of the average, at the top of the nut, to 179 percent at the base, while with fine threads the loads vary from 37 percent of the average at the top of the nut, to 231 percent at the base. Because of this condition, Professor Buckingham proved that bolts

with fine threads used in steel nuts, loaded statically, failed at stresses far under the tensile loads of bolting material, while coarse threads did not.

Loosening of bolts and nuts in service is sometimes a problem and it has been claimed that fine thread products are less apt to loosen. However, it would appear that neither coarse nor fine thread fasteners will loosen if bolted joints are designed to avoid excessive load changes in the bolt. This generally can be accomplished by proper design of joints to provide rigidity of bolted parts and by proper initial tightening of the bolt. This has been again demonstrated by recent research in the use of

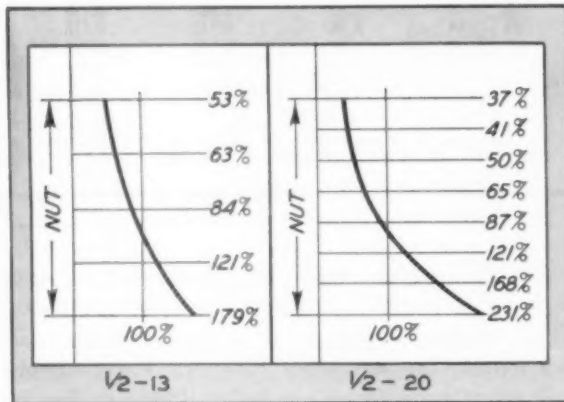


Fig. 6. The variation in stress from the top to the bottom is much less in a nut having coarse threads than in one with fine threads.

high-strength bolts in structures such as railway bridges, ore unloaders, and similar structures subject to severe shock and vibration. In the many full-scale laboratory tests and field installations using coarse threads, there has not been a case of nut loosening where the above principles have been employed.

One of the most frequently cited advantages of fine threads is their higher computed static tensile strength based on the larger tensile stress-area of a fine threaded bolt. This stress-area is about 12 percent larger for fine thread bolts. This difference usually can be absorbed in the safety factor, except possibly in critical applications such as aircraft. In any case, this higher breaking load of fine thread bolts cannot be utilized unless the stripping strength of the threaded connection is at least as high, which is sometimes not the case. Following are some of the factors affecting stripping strength:

(1) Load concentration on the first thread inside the nut is proportionately greater in fine threads, thus precipitating progressive failure of succeeding threads at lower than expected loads. This occurs to a greater degree when either the internal or the external thread material is rather hard or brittle, such as in the case of holes tapped in brittle cast iron or case-hardened threads. Coarse threads are generally used in these cases.

(2) Decarburization often is present at and below the surface of the threads and is difficult and expensive to avoid. A given amount of decarburization is less effective in reducing the stripping strength of coarse threads because of their greater thread depth. Coarse threads have been found necessary in order to sustain stripping strength when studs or bolts are used in holes tapped in soft material such as copper alloys and aluminum, or when both bolt and nut are made of these materials.

(3) When a nut is loaded, it tends to expand because of the wedging action of the thread. This expansion occurs most markedly at the nut base because of the load concentration at the first thread inside the nut. This expansion results in recession of the nut threads radially with respect to the bolt threads, producing thread contact at thinner sections of the thread and thus precipitating stripping. This expansion has less effect in reducing the stripping strength of coarse threads because of their greater thread depth.

(4) Corrosion is less damaging to coarse threads because of their comparatively larger size. This is important in equipment, machinery and structures subject to constant outdoor exposure. Protective coatings can be employed, in which case more effective coatings can be applied to coarse threads. Hot galvanizing is difficult and generally practical only for 16-tpi and coarser. This is true of other heavier coatings, such as parts requiring copper-nickel-chrome plating, which are generally specified with coarse threads. Where threads are too fine it is often necessary to go to the expense of special or additional operations to effect proper assembly of heavily coated fasteners.

(5) Coarse threads are less difficult to handle since they are less sensitive to damage from slight nicks, particularly in the larger sizes.

(6) Coarse thread products are inherently less difficult and time-consuming to assemble. The fact that a coarse thread fastener requires only two-thirds the revolutions to assemble leads to lower cost. A coarse thread bolt enters a nut or tapped hole with less tendency to cross-thread, even when mating parts are not truly positioned with respect to each other. This is why nuts which are located in inaccessible places are usually coarse threaded. Coarse thread fasteners are less apt to gall and seize in high-cycle assembly. These difficulties in assembly may be minimized in original shop assembly, but in the field, troubles increase, particularly where repairs and reassemblies must be made several times during the life of a piece of equipment.

There are many more reasons why coarse threads have a preference over fine threads, but the main fact is that the coarse threads give us a stronger fastener unit for stronger joints which will stay tighter.

Basic Forming Techniques for the Copper Base Alloys

By Lester F. Spencer

CHIEF METALLURGIST
LANDERS, FRARY AND CLARK

Part III

WHEN A DRAWING action takes place, metal flows from one form to another under tensile loadings.

Group 3—In a drawing sequence, the first operation after blanking is known as 'cupping' which may be followed by one or more operations known as re-draws. The most conventional method of cupping is performed on a double-action press. Rubber pads or air or hydraulic cylinders are used to provide blank-holding pressures on single-action presses. In drawing a cylindrical shape, the metal is forced into the die by a punch, causing compressive strains in the peripheral direction in the rim of the blank and tensile stresses along the side walls. The compressive stresses tend to buckle or wrinkle the rim of the blank, but if the draw is shallow, this may be eliminated by the ironing action in the gap between the punch and the die. Ordinarily, wrinkling is prevented by careful adjustment of the hold-down pressure exerted by the blankholder so that a perfectly smooth shell is produced. Minimum hold-down pressure as given for copper is approximately 200 psi; for the brasses, 250 to 300 psi can be used; and, for the phosphor bronzes, 400 psi can be employed.

Although the blank hold-down pressure is intended to prevent wrinkling, it must not be too tight so as to prevent thickening of the blank as it approaches the drawing radius of the die. This thickening is a natural result of contraction of the diameter and, if it is prevented, there will be a subsequent increase in the force required to form the cup and fracture may result. The clearance normally used between the inside of the die and the punch is slightly greater than the gage of the metal to be drawn so as to allow this thickening action of the cup wall near the top. Only a short length of cup is actually squeezed between the punch and the die and this pinching effect or wall thinning is known as ironing. An excessive pinch between the punch and the die, or an excessive hold-down pressure, is likely to cause failure by tensile stretching in the body of the cup.

The punch determines the contour of the drawn section, the walls of which blend into the punch

nose by a radius, which is often controlled by the subsequent operations to be performed on the cup and the radius selected on the drawing edge of the die. Large radii on both the punch nose and die will promote ease in the flow of metal. On the punch, a large radius will permit thinning of the bottom of the cup, whereas a small radius has the opposite effect and may localize severely the normal thinning of the side walls at this point. Too large a radius on the die permits wrinkling of the blank and either results in a poor surface or folds at the top of the cup. Too small a radius may tear the outer surface of the cup by a sharp reverse bend that the metal is forced to undergo. The usual die radius is between 5 and 10 times the metal thickness, but occasionally certain designs will require a sharp radii, particularly if the cup is to be left with a flange.

The extent of reduction between blank and cup will vary, but normally a diameter reduction between 40 to 45 percent can be obtained. Depending upon the ductility of the particular copper base alloy employed, the thickness of the blank and the tool design, greater or lesser reductions can be made. Where ironing is employed, high reductions can be realized. Experimentally, cups can be made with diameter reductions as high as 55 to 60 percent, but it is difficult to control them in production. The difficulty occurs in regulating the blank-holding pressures and the tendency of the tools to foul. In the softer alloys which work-harden less readily, there is a danger of fracturing the cup by tensile failure near the bottom radius in heavy cupping operations. Also, the thinner the gage to be drawn, the less will be the reduction that can be safely experienced.

In a re-draw operation which further forms the cup into the desired shape, two general procedures are utilized. A reduction in the diameter of the shell can be produced with little or no pinching or ironing of the wall. Relatively slight reductions can be obtained accompanied by a considerable reduction in wall thicknesses. The wall pinching procedure is much more commonly employed in the

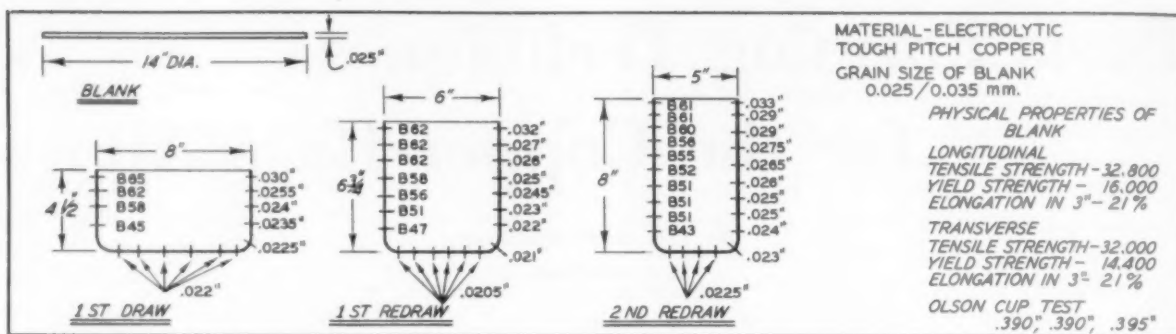


Fig. 10. In this sequence of operations, a large thin blank is formed into a cup, reducing the diameter from 14 to five inches. This also may be done in steel but is less common.

forming of brass than with steel. In the former method, a large thin gage blank is used to form the cup as shown by the sequence of operations in Fig. 10. In the cupping operation there is a normal thickening of the side walls near the top with a slight pinching action at the bottom as the radius is approached resulting in a reduction of wall thicknesses. This same condition is followed through on the re-draws with the entire procedure as illustrated being followed without any intermediate anneals.

In a procedure involving the reduction of wall thickness or ironing, a small blank of heavy gage is used. A classical example of this procedure is the forming of cartridge brass shell cases. Another sequence of operations involving cupping and several redraws where considerable ironing has been performed is shown in Fig. 11. The method to follow on any specific problem will be dependent upon several factors including the design of the completed part, the number of auxiliary operations required such as annealing, pickling, etc., the cost factor of the alloy used and the anticipated scrap.

Factors such as tool design, type and method of application of lubricant, grain size and mechanical properties of the alloy to be formed will decide, to a great extent, the amount of cold work permissible in any one draw or series of draw operations before an intermediate anneal is required. Coarse-grained alloy compositions usually permit greater reductions to be made than a composition exhibiting a fine grain size. However, the strength characteristics must be considered since a coarse grain composition may not be strong enough to support the depth of cup desired, resulting in bottom breakage. This will be dependent upon gage thickness of the blank since the heavier gages of coarse-grained material will permit deeper draws with less load on the press. Also, coarse-grained material may be objectionable due to the 'orange peel' effect which may increase finishing costs, especially where the completed item is to be buffed or plated.

With the eyelet machine, the blank to cup and

subsequent re-drawing operations is of considerably less reduction per individual operation than that experienced in normal press work due to the fact that no intermediate annealing operations are placed on the item formed. The eyelet machine has multiple slides or plungers which are individually adjusted and timed. They usually have a front-to-back roll feed at the blanking station and a transfer feed with gripping fingers for carrying the piece to successive stations for piercing, forming or drawing operations. An excellent example of eyelet forming is shown in Fig. 12 which is the operational sequence of a pen cap, the wall thickness of which is approximately the same as the thickness of the blank. The reduction percentage from blank to cup is approximately 40 and the re-draw percentage figure is usually 15. However, these figures may vary depending upon the specific conditions present. In the fabrication of smaller parts, it is often more economical to use an operation known as 'cut and draw'. This eliminates the use of blanks and further economies can be realized by the use of a decoiler in back of the press. The material comes directly from the coil, goes through the rolls for lubrication and is cut and cupped in the press. A push through die is usually employed.

In many instances, spinning, an operation for the production of irregular contours, is performed on parts that have been previously drawn to a specific shape. It can also be employed in the shaping of material directly from the blank and is usually an excellent method of forming where the production requirements are low. The initial cost of equipment and maintenance of tools is relatively small in comparison to that required for drawing, and as a consequence, the relative cost per piece is low. In either case, whether the part formed comes directly from a blank or whether it is a further shaping of a drawn product, the material should be soft, since spinning is usually considered as a severe fabricating operation. Although most of the 'alpha' copper base alloys can be shaped at will, strain hardening will occur and in many instances, intermediate annealing is required. The sequence of operations and the

extent to which intermediate annealing must be practiced is determined on the basis of trial and error.

Group 4—Those operations such as coining, stamping, embossing and cold heading are ordinarily classified under the 'squeezing' group of press operations and are ordinarily considered as the most severe of all the groups listed. All of the copper base alloys that can be cold drawn or formed can also be stamped, coined and embossed; in many instances, depending upon the alloy, thickness of stock and the amount of cold working to be performed, a $\frac{1}{8}$ to $\frac{1}{4}$ temper stock is used in order to give the finished product the stiffness desired. In many instances, stamped parts are assembled by either lock-seam joints, soft solder, silver solder or by welding thus providing an inexpensive method of forming, replacing, in some cases, either forgings or castings.

Cold heading is an upset operation in which a head is formed on a length of wire or rod, or a flange is upset at some portion of the specified length. The cold heading properties of the various copper base alloys are usually compared accurately by stating the number of 'diameters' of upset permissible. This 'diameter upset' is the ratio of the length of the portion to be upset to the diameter of the wire. The non-leaded high brasses have very good heading properties and can be usually upset about three diameters. The high brasses containing

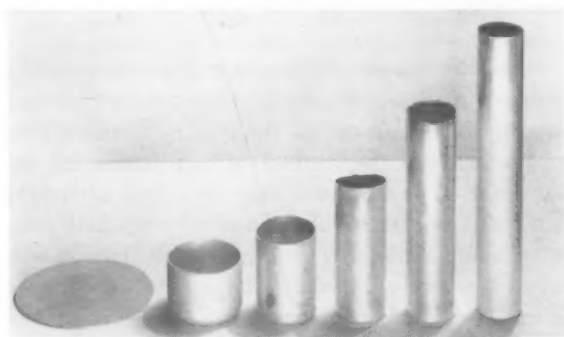


Fig. 11. Considerable ironing has been performed in this cupping operation and the subsequent redraws.

the lead will be influenced by the lead content within the composition, and the greater the lead content, the less will be the expected upset. The low brasses can be upset more than three diameters, but the shear strength of these materials may easily be exceeded in the forming of certain shapes, causing shear failure. Naval brass containing small percentages of tin react similarly to the leaded high brasses in an upset operation with the exception that the stiffness is perceptibly greater and more power is required to perform a given upset. Silicon bronze, type A, is a moderately useful cold heading alloy, whereas type B silicon bronze is an extremely

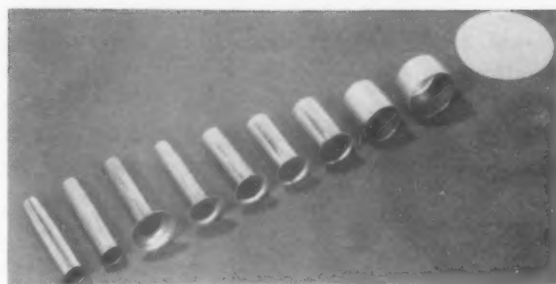


Fig. 12. The forming of this pen cap, the wall thickness of which is approximately the same as that of the blank, is an example of eyelet forming.

useful one; a three diameter upset is usually possible. This material has high strength characteristics, resistance to seasoning or stress corrosion cracking and has excellent corrosion resistance, especially in marine atmospheres.

Heading wire must be free from scratches, folds, blisters and similar imperfections, since these defects will appear as cracks or breaks, especially where the material is upset to a large diameter. Also, the wire should be extremely malleable so that it will fill out the die without developing dangerous shearing stresses such as may be experienced in the manufacture of bolts or rivets with large heads. At the same time, heading wire should be of the correct temper so that the finished item will be stiff and strong in the shank. In some instances, the more severe heading operations may require intermediate anneals before the finished upset is realized.

Tools and Lubricants

The copper base alloys are considered to be among the most ductile of metals. In the drawing of the 'alpha' copper base alloys, comparatively low friction will result between the metal drawn and the die components, provided that the work is properly lubricated and free from contaminants such as scale or dirt. As a consequence, the wear experienced on these types of tools is low when compared to a similar operation involving the forming of steel. Ordinarily, the quenchable carbon steels or a low carbon carburizing composition can often be employed as tool material; a recommended hardness of not less than Rockwell C63 should be employed on drawing dies. The resultant die components should be highly polished, especially in the area of radii. For unusually long runs, steel drawing dies and punches can be hard chromium plated or, as an alternative, the punches can be made from Carboloy in order to keep the tool-wear to a minimum as well as maintain the expected close tolerances.

In a blanking operation, the choice of tool steel will be dependent upon the length of run, the alloy type and the shape of the blank. Ordinarily, for simple shapes a high carbon water hardening steel

would suffice, but where intricate shapes are employed, or the material blanked is an alloy such as beryllium copper, better life expectancy can be expected from the use of a high carbon-high chromium alloy tool steel. In the blanking of an alloy such as beryllium copper, it has been recommended that the strip of sheet preferably be cadmium plated prior to the blanking operation.

The usual requirements for a coining die is that (a) the hardness should be within the range so that the dies will not split upon impact; (b) the die face should not sink, a condition usually preceding spalling; (c) the die should not crumble or chip on sharp edges; and, (d) pick-up or galling should be at a minimum. The selection of a die steel for this type of operation is usually a matter of preference. The water hardening carbon steel compositions, which in the past had been widely used, are but shallow hardening and will not withstand intense pressures. The standard chromium-nickel-molybdenum drop forge die block steel containing from 0.65 to 0.70 percent carbon is often used as a coining die material. This alloy is usually pack hardened and oil quenched, the resultant product having high compressive strength. It holds its shape well during heat treatment and after proper tempering, gives a coining die of long life. For severe service requirements and long life expectancy, the high carbon-high chromium compositions are often used. Under average conditions, tools that are employed for trimming, embossing or bending can be made from a water hardening tool steel composition, the selection of the low alloy compositions being dependent upon both service conditions, design and life expectancy.

Header dies are usually made with hard faces and work holes with softer insides. If the header die is hardened completely through, there would be a danger of either cracking or chipping during service. Usually to obtain the desired hardness condition, a stream of water is forced through the hole and on the working face at the hardening temperature and after a delay of a few seconds, the whole fixture is immersed into the quenching medium. The exit of the water from the die is usually impeded to prevent venturi action and often it is necessary to provide some means of diverting the entering stream so that the water will hit all surfaces evenly. The carbon steel compositions containing slight amounts of either chromium or vanadium as optional elements are used frequently, but where service requirements and/or alloy composition makes it necessary to use an alloy tool steel, either the 5 percent chromium, the high carbon-high chromium of the 18-4-1 high speed tool steel can be used. The practice of grinding dies after hardening is increasing; this not only produces a more accurate die, but also insures a high polish as well as removing surface metal which may be softer due to decarburization. Straight holes and

good finish means longer die life as well as improved product.

A lubricant that is effective should maintain a film so that metal-to-metal contact is avoided. In the selection of a lubricant, the first requirement is that a wetting action be produced so that the entire surface area of a blank or formed part be covered and that this film remain upon standing. This is particularly desirable where a number of parts are lubricated prior to drawing and a period of time elapses before drawing actually begins. Another prerequisite of a good lubricant is that it have sufficient body so that the film is maintained under the forming pressures. The lubricant should be easily removed whenever required and should not stain the metal.

This problem of staining may prove quite troublesome since frequently there are occasions where drawn or formed parts are held over a period of time before they enter a washing procedure. An attack on the surface of the metal may result and if the part is annealed after washing, red stains may form on the surface. Fatty oils, particularly lard oil, is quite active in this respect. Soap or any alkaline or acid solutions may cause either red staining or dezincified spots on the surface of the part. Irregardless of the type of lubricant employed, good practice will dictate removal of lubricant prior to annealing operations. Also, if the work should stand for an indefinite period, it is best to remove the lubricant and stress relief anneal so as to prevent any difficulty occurring from either stress or season cracking.

The selection of a lubricant is dependent upon a number of variables among which are the type and severity of the operation, the type of metalworking equipment and the method of application of the lubricant. The lubricant may be either a straight lard oil, a mixture of animal or vegetable oils, water-soap mixtures or soluble oils. At times, where a cup is severely ironed or a large reduction in gage is involved, the heavier pastes can also be employed which contain solid lubricants such as talc or graphite.

References

1. *Metallurgy of Deep Drawing and Pressing*, J. D. Jevons, J. Wiley & Sons, Inc., 1942.
2. *Bridgeport Brass Technical Handbook*, Bridgeport Brass Co., Bridgeport, Conn., 1950.
3. *Copper and Copper Base Alloys*, R. A. Wilkins and E. S. Bunn, 1943, McGraw-Hill Book Co., N. Y.
4. *Principles and Methods of Sheet Metal Fabrication*, G. Sachs, 1951, Reinhold Pub. Corp., N. Y.
5. *Cold Working of Brass*, L. E. Gibbs, Amer. Soc. for Metals, Cleveland, Ohio, 1946.
6. *Bliss Power Brass Handbook*, E. W. Bliss Co., Toledo, Ohio, 1950.
7. *Plastic Working in Presses*, E. V. Crane, 1945, J. Wiley & Sons, Inc., N. Y.
8. *The Metals Handbook*, 1948, Amer. Soc. for Metals, Cleveland, Ohio.

TOOL ENGINEERING DATA

NUMBER SIXTY-TWO

American Standard Tolerances for Ball and Roller Bearings (Continued)

Table 8—Snap Ring and Groove Dimensions.

Bearing Bore in Mm				Tolerances in Inches				
Series				A	B	C	T	W
Extra Light 10	Light 02	Medium 03	Heavy 04		Width	Diameter	Thickness	Width
12-25	10-25	10-20	...	±0.003	±0.003	+0.000 -0.010	±0.002	±0.003
30	...	...	...	±0.004	±0.003	+0.000 -0.010	±0.002	±0.003
35-85	30-75	25-60	17-50	±0.004	±0.003	+0.000 -0.020	±0.002	±0.003
90-160	80-130	65-110	55-90	±0.005	±0.003	+0.000 -0.020	±0.002	±0.003

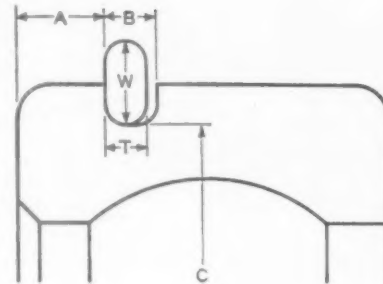


Table 9—Balls and Rollers.

Maximum permissible variation of diameter between the largest and smallest ball in any assembled ball bearing shall be:

For ball diameters

up to $\frac{3}{8}$ inch, inclusive.....0.00005 inch
above $\frac{3}{8}$ to 1 inch, inclusive...0.0001 inch
above 1 to 2 inches, inclusive.0.00015 inch

Maximum permissible variation of diameter between the largest and the smallest roller in any assembled cylindrical or spherical roller bearing shall be:

For roller diameters

up to $\frac{3}{8}$ inch, inclusive.....0.0001 inch
above $\frac{3}{8}$ to 1 inch, inclusive..0.00015 inch
above 1 to 2 inches, inclusive....0.0002 inch
above 2 inches.....0.00025 inch

Maximum permissible variation of diameter between the largest and smallest roller in any assembled tapered roller bearing shall be:

Specifications:

Numbers 0 and 3.....0.0001 inch
Numbers 2, 4B and 4.....0.00025 inch

Table 10—Hardness of Balls, Rings and Rollers.

Hardness of bearing rings, balls and rollers taken on Rockwell C-scale shall be 58-66, depend-

ing on bearing size and material. This statement does not apply to corrosion-resistant materials.

Table 11—Airframe Bearings.
Tolerances in Inches

Types*		Bore d_m				Outside Diameter D				Width				Chamfer C Both Rings	
Shielded	Sealed	d_m Average		d max	d min	D_m Average		D max	D min	Outer Ring H		Inner Ring F		Max	Min
		High	Low			High	Low			Max	Min	Max	Min		
K	KP	+0.0000	-0.0005	+0.0002	-0.0007	+0.0000	-0.0005	+0.0005	-0.0010	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000
K-A	KP-A	+0.0000	-0.0005	+0.0002	-0.0007	+0.0000	-0.0005	+0.0005	-0.0010	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000
K-B	KP-B	+0.0000	-0.0010	+0.0003	-0.0013	+0.0000	-0.0010	+0.0010	-0.0020	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000
K-S		+0.0000	-0.0005	+0.0002	-0.0007	+0.0000	-0.0005	+0.0005	-0.0010	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000
D	DP	+0.0000	-0.0005	+0.0002	-0.0007	+0.0000	-0.0005	+0.0005	-0.0010	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000
DS	DSP	+0.0000	-0.0005	+0.0002	-0.0007	+0.0000	-0.0005	+0.0005	-0.0010	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000
Stainless Steel	Bearing Steel														
A500	B500														
A543	B543	+0.0007	-0.0007	+0.0010	-0.0010	+0.0000	-0.0010	+0.0005	-0.0015	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000
A544	B544														
A545	B545														
A546	B546	+0.0010	-0.0010	+0.0016	-0.0016	+0.0000	-0.0015	+0.0008	-0.0023	+0.000	-0.005	+0.000	-0.005	+0.015	-0.000

*AFBMA Designations.

American Standard Tolerances for Ball and Roller Bearings (Continued)

Table 12—Thrust Ball Bearings

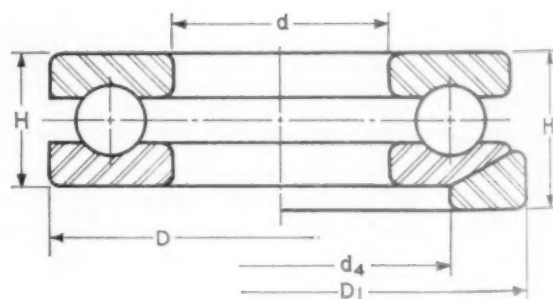
American Metric

Bore			Height	Outside Diameter		
Dimension in Mm		Tolerance in Inches	Tolerance in Inches	Dimension in Mm		Tolerance in Inches
Over	Incl			Over	Incl	
0	30	± 0.0004	± 0.005	0	140	$+0.000$
30	50	± 0.0005	± 0.005	140	200	-0.002
50	80	± 0.0006	± 0.005	...	...	-0.003
80	120	± 0.0008	± 0.010	...	...	....
120	140	± 0.0010	± 0.010	...	...	....

ISA Metric

Nominal Diameter d in Mm		Tolerances in 0.0001 Inch							
		d		d_4		H		H_1	
Over	Incl	Min	Max	Min	Max	Min	Max	Min	Max
..	30	-4	+0	-0	+28	-30	+0	-30	+20
30	50	-5	+0	-0	+33	-39	+0	-39	+20
50	80	-6	+0	-0	+39	-49	+0	-49	+30
80	120	-8	+0	-0	+47	-59	+0	-59	+30
120	180	-10	+0	-0	+55	-69	+0	-69	+39
180	250	-12	+0	-0	+55	-79	+0	-79	+39
250	315	-14	+0	-0	+63	-89	+0	-89	+49
315	400	-16	+0	-0	+71	-118	+0	-108	+59
400	500	..	..	-0	+71	..	..	..	..
500	630	..	..	..	..	..	..	..	..

Nominal Diameter D and D_1 in Mm		Tolerances in 0.0001 Inch			
		D		D_1	
Over	Incl	Min	Max	Min	Max
..	30	-4	+0	-12	+0
30	50	-5	+0	-14	+0
50	80	-6	+0	-18	+0
80	120	-8	+0	-24	+0
120	180	-10	+0	-30	+0
180	250	-12	+0	-35	+0
250	315	-14	+0	-41	+0
315	400	-16	+0	-47	+0
400	500	-18	+0	-53	+0
500	630	-24	+0	-71	+0



—American Standards Association

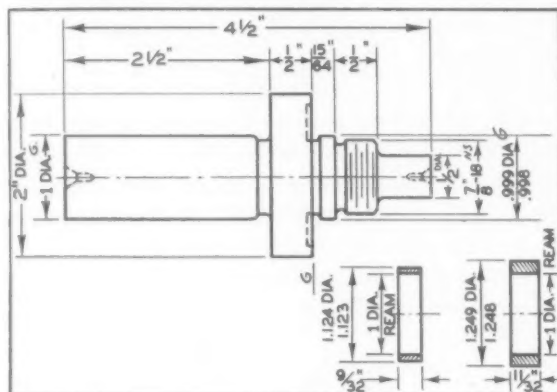
Gadgets

Ingenious Devices and Ideas to Help
the Tool Engineer in His Daily Work

Machining Brown & Sharpe Cams

A method for machining cams utilizes a DoAll saw, a file and a magnifying attachment. Cross slide cams require about two hours, while about three hours are necessary to produce a lead cam. Accuracy of 0.003-0.005 in. is obtainable for each cam lobe.

Most important step in the process is the proper layout of the true rises by use of the height gage and scribing lines at each 0.01 in. of the lobes. To facilitate this operation, a special arbor can be made with a shoulder which corresponds with the centerhole of the cam; one end is threaded and a knurled locknut made to fit.



The cam is slipped on the arbor and slightly locked and the arbor is fastened in a V-block. The V-block is placed on a block high enough above the surface plate to permit the cam to be in a vertical position. Cam blanks should be used which have the radial lines from 1 to 100 inscribed, or printed when using plastic cams. Steel blanks should be properly blued. The radial rise lines are then scribed on the blank.

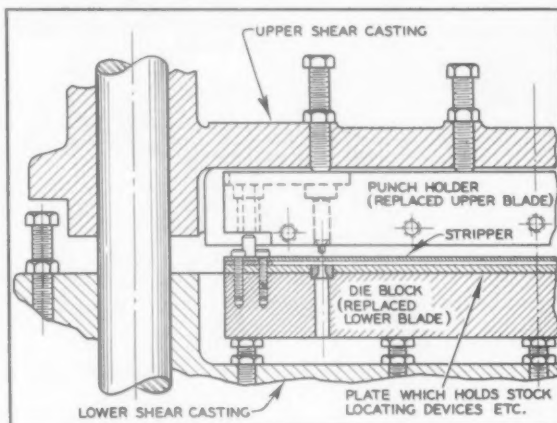
To facilitate an exact "topsetting," a short square can be used or a four- or five-in. size block can be ground to the center height of the arbor above the surface plate. Then the corresponding horizontal lines can be lined up. The lead ON and lead OFF curves are laid out in the usual manner with B & S templates, following the cam design sheet. The same arbor can be used for all sizes of cam blanks if a one-in. shoulder is provided for B & S 00 cams, and respective bushings of 1 1/8 and 1 1/4 in. OD for #0 and #2 machines.

Cornelius M. Woog
Norwalk, Conn.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of \$5.00 for each item.

Punching with a Shear

The problem was to punch two 0.125-in. holes, 8 1/2 in. apart, 0.500 in. from the edge and otherwise centered on 10x11x0.036 in cold rolled steel sheets. No punch presses were available.



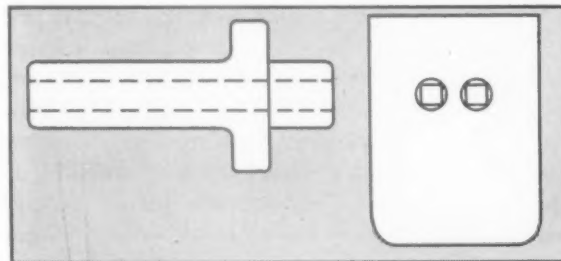
My solution involved the use of a No. 3 DI-ACKRO table shear. The upper blade was replaced with a punch holder incorporating the two punches, and the lower blade with a unit consisting of a die block and table, including positioning devices.

Initial alignment of punches and dies was facilitated by pilot pins after the punch holder was fastened to the machine, using the same mounting screws utilized to mount the upper shearing blade. The die block and table unit was then clamped to the table of the machine with straps upon which the pilot pins were retracted.

E. J. Druan, Jr.
Boston, Mass.

Staking Die

An inexpensive but effective staking die can be made for forming a square stake at the end of a round hollow pin tube. The square stake serves as

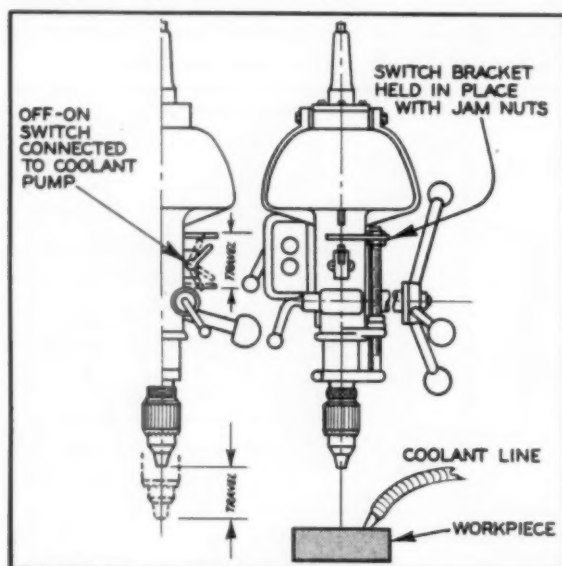


an anti-turn feature. This is accomplished as shown in the sketch by making a square tapered insert. The two pins were staked to a phenolic piece. By using a hydraulic press and a governor, the proper staking depth can be maintained easily.

Anthony Gabriele
Brooklyn, N. Y.

Automatic Coolant Pump Switch

It is not necessary to maintain a continuous flow of coolant on a drill press due to the intermittent operation of the tool. By incorporating the on-off switch of the coolant pump with the down stroke of the drill feed handle, the coolant pump can be turned on only when necessary.

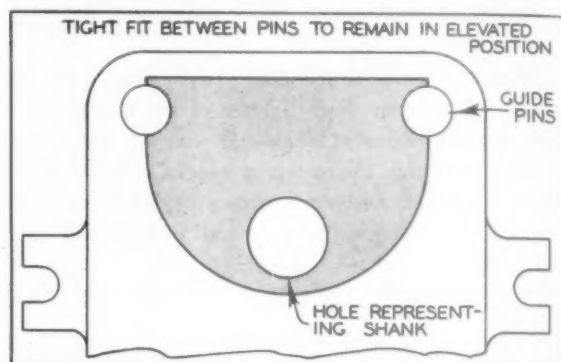


When the drill press switch is turned to off after the drilling operation, the spring return on the drill feed handle returns it to an up position, turning off the coolant pump at the same time.

Charles A. Haugk
Fort Wayne, Ind.

Locating Holes in Punches

Locating holes in the punch of a die set without weakening or interfering with the shank is often troublesome to the die marker. The method I have found practical is to use a gage made of transparent plastic that fits between the guide pins and is wide enough to accommodate a hole the diameter of the shank in the same position as the shank is in relation to the guide pins of the die set.



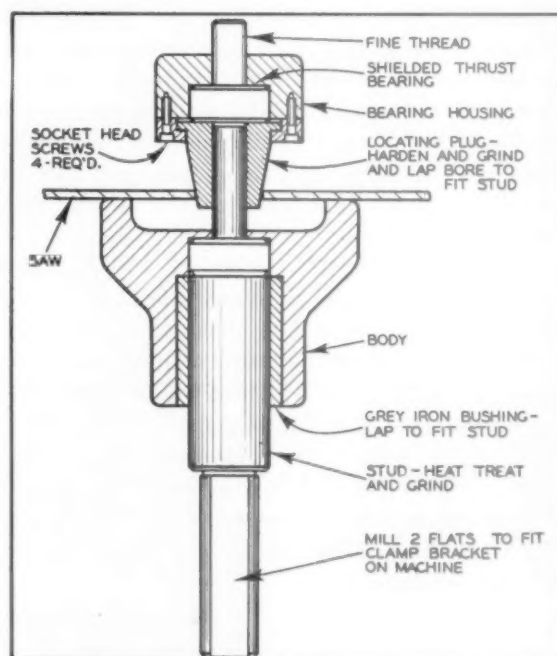
The use of this gage permits the various holes to be located in predetermined relation to the shank. A different gage must be made for each size, make and model of the die sets used in the department. It is especially suitable for small die sets up to 12×12 in. in progressive and/or form types or where holes are closely spaced.

Joseph E. Pollak
Quincy, Mass.

Saw Holder

This is a saw holder for holding carbide-tipped circular saws for diamond-grinding the faces and tops of the teeth. The saw holder furnished as original equipment with the grinder was not satisfactory because of the extreme difficulty in maintaining the concentricity requirements necessary for optimum results in production sawing. This original holder was of the slotted post type with the saw located axially by means of a tapered bushing wedge inserted in the slotted center post. Constant vigilance by the operator was required to keep the wedge in position. If the wedge were too tight, the saw was difficult to index from tooth to tooth, and, if the wedge loosened up, the saw moved axially, resulting in a high or low tooth.

The saw holder shown in the sketch has all bearing surfaces hardened and ground except the cast iron bushing, the bore of which was carefully lapped to fit the stud. The locating bushing, also lapped to fit the stud, is tapered to take saws with either 1-in., 1-1/8-in., or 1-1/4-in. bores. Since the clamping pressure is applied between the two thrust bearings, the saw will rotate easily regardless of the pressure ap-



plied and there is no tendency for the saw to loosen or tighten up during the grinding operation.

J. W. Newcomer
Kennett Square, Pa.

Forming Tools for Magnesium Alloys

By John Starr

THE STILL GROWING demand for stronger-yet-lighter metals in the construction of airplanes has recently necessitated a number of tooling innovations, due to the unique fabricating qualities of magnesium alloys.

For example, where many metals can be annealed and press-formed at room temperature, all but the thinnest types of magnesium sheet stock must usu-

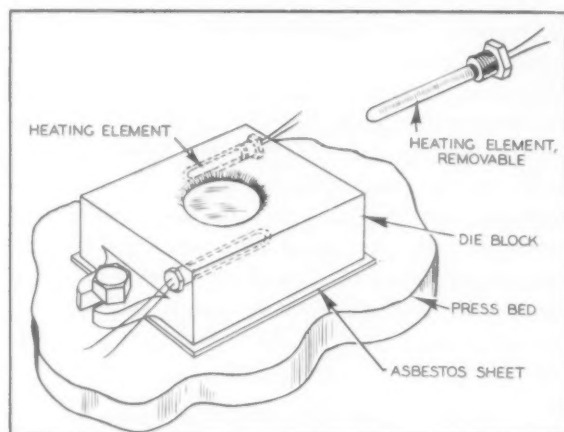


Fig. 1. The die block can be drilled and tapped to permit the use of electrical heating units.

ally be stamped at elevated temperatures, control of which can be extremely critical (as indicated by the accompanying table). It is generally necessary to convey heat to the sheet materials via the forming tools, since the materials may deteriorate if preheated for any length of time, yet it isn't possible to preheat conventional form blocks or dies prior to each press operation without greatly increasing tooling costs or wasting many valuable hours of production time.

Therefore, tool engineers at Consolidated Vultee Aircraft Corp. have found it worthwhile to develop stamping dies with integral electrical heating ele-

ments. As shown in Fig. 1 the design of each die is such that its block can be drilled and tapped to permit the use of electrical heating units therein (the total number of heaters in each die depending on the dimensions of the tool). A thermostat on each die member controls the output of the heating elements within the block in conformity with the temperatures required to form different types of magnesium sheet stock. Relatively slow press action is generally essential to the use of these tools, since the intergranular heat and slip planes of magnesium do not react with the speed of most metals, but fairly fast work has been done where it was practical to pre-heat the blanks.

Ferrous materials are frequently used in fabricating tools for the forming of preheated magnesium alloys, but tool engineers at Boeing Aircraft Co. have reportedly saved considerable money by making such dies from aluminum alloys and using thin Fiberglas coverings on the tooling surfaces to pre-

Fig. 2. Magnesium alloy stampings are heat-dimpled in coining dies and rivet squeezers.



Table I—Forming Temperatures for Magnesium Alloys

Magnesium Alloy (USAAF Spec. No.)	Minimum Bend Radii at Room Temperature	Maximum Forming Temp. deg F	Minimum Bend Radii at Max Form. Temp
11339 A	5t	600	3t
11339 H	12t	400	4½t
11340 A	3½t	600	1½t
11340 H	10t	300	4t
11338 A	7t	600	4½t
11338 H	18t	400	4½t

vent electrolytic reactions between heated aluminum and magnesium materials.

In the Northrop Aircraft plant at Hawthorne, Calif., coining dies and rivet squeezers are being used to heat-dimple magnesium alloy stampings which must be assembled with countersunk rivets, bolts, etc. See Fig. 2. Electrical heating elements for the dies are integral with the punch and die posts. The squeezers are standard machines with throat depths ranging from 0.62 in. to 24 in. and throat openings of 0.62 in. to 8 in. Electronic controls of the type used in resistance welding make it possible to regulate the time, temperature, and pressure of each dimpling operation so as to prevent the work-hardening and cracking that could be anticipated if magnesium alloys were dimpled with cold coining dies.

Forming With Hydraulic Presses

Kirksite dies with internal heating elements are being used to stretch form magnesium alloys with hydraulic press equipment in the North American Aviation factory at Los Angeles. See Figs. 3 and 4. Thermostatic controls eliminate the possibility of heat damage to the cast-alloy tools, and this is a disadvantage because the larger dies may require as many as two hours of heating time prior to production work. However, the cost of more expen-

Fig. 3. Magnesium alloy are stretch-formed with hydraulic press equipment in an aircraft factory.

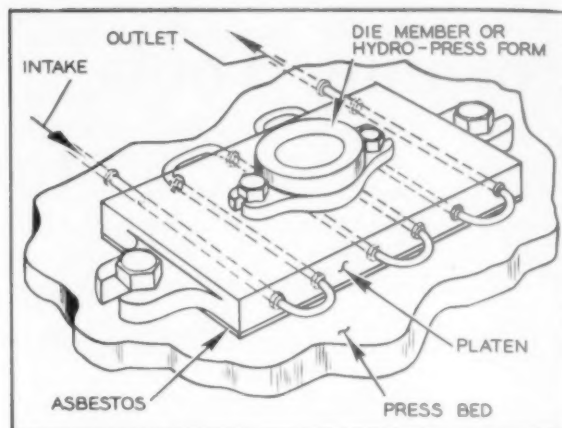
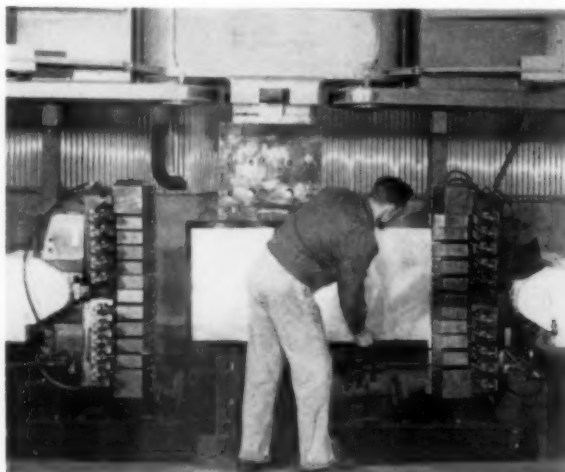
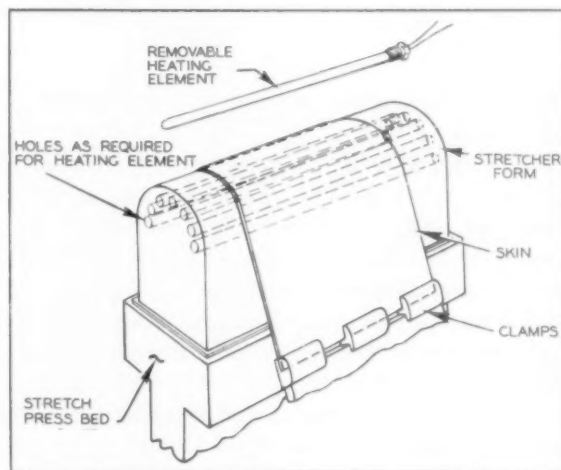


Fig. 4. Sketched here is a Kirksite die with internal heating elements for stretch-forming magnesium alloys.

sive tools could not be justified in terms of aircraft production requirements; and it would not be practical to stretch most magnesium alloys more than three percent if other low-cost tools were specified, because low stretching temperatures would be mandatory. When stretch-formed at temperatures of 300 to 500 deg F, magnesium sheet stock has been elongated as much as eight percent.

Where the Guerin process is used to fabricate magnesium alloys in the Douglas Aircraft plant, presses with internally-heated platens save considerable money—by eliminating the cost of individually-heated dies, and by increasing the life-span of rubber pressure pads. See Fig. 5. The lower platen of each press is cored for heating purposes, so that tools on the platen will be heated like the molds used in mass-producing plastics, and forming temperatures up to 400 deg F have been used for long periods of time in fabricating magnesium sheet stock without burning the pressure pads made of heat-resistant rubber.

Fig. 5. Presses with internally-heated platens save considerable money in the fabrication of magnesium alloys.



Fixed Gage Standards

(Continued from page 42)

The manufacturer of threaded parts must check lead, angle, and thread form to make sure that his parts, when finished, meet specifications and have the required assemble-ability and interchangeability. He must be able to analyze his problems so as to determine the corrective measures necessary. Purchasers of those same parts may require inspection to assure assemble-ability only. Here are two totally different approaches to the inspection of the same threads. No national standard may prescribe any specific gage or gaging method as the one which must be used. The national standards for screw threads B1.1 and H28 establish maximum and minimum limits for the several classes. Supplementary standards for tools of production and for gages can be of help but they may not be interpreted as increasing or decreasing the primary standard.

Relation of Fixed Gages to Statistical Quality Control. A few years ago new inspection methods and techniques seemed to threaten the existence of the fixed type GO/NOT GO or limit gages. Mechanical, optical, electrical and pneumatic gaging instruments were developed. Along with the advance in instrumentation has been the development and skillful application of statistical quality control. Statistical analysis has helped tremendously in continuous process manufacture (paper, rubber, chemicals, etc.) to assure a high quality end product. The use of gages, teamed with quality control charts, has helped operators in the metal-working industry to achieve higher levels of adherence to specified tolerances. Sampling plans in which a relatively small number of pieces is selected at random, checked thoroughly and the results analyzed statistically, have enabled receiving and inspection departments to accept satisfactory lots and reject unsatisfactory lots speedily and at low cost.

Use of Fixed Gages in Sampling

Experience over a number of years has demonstrated that sampling techniques are accurate and effective. Methods are simple and economical. It is not essential to have a detailed knowledge of fields such as statistics, mathematics or the laws of probability and of variables.

Any effective sampling plan using fixed type gages must have as its goal assemble-ability within the tightness and looseness limits desired by the engineering specification with a limited risk of accepting some individual parts beyond the blueprint limit. This plan has worked so well in assuring assemble-ability within prescribed clearance limits because so seldom is the smallest external member mated with the largest internal member, or

vice versa, in the normal course of assembly. In one plant handling some 60,000,000 individual dimensions per year, dimensions which might affect assemble-ability, there have been just two instances in six years when mating parts would not assemble. Contrast this record with the preceding years in which similar instances cropped up three or four times per month. There is a risk in statistical sampling plans, a calculated or limited risk.

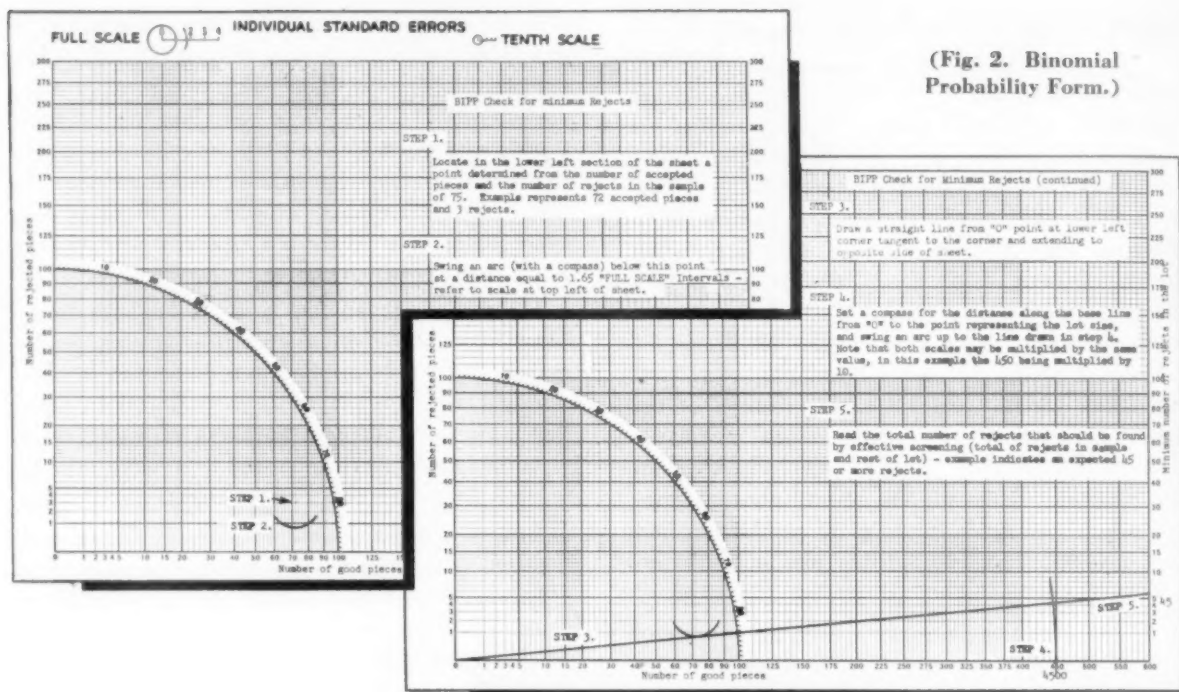
This sampling plan may be applied only to dimensions which affect an assembly—diameter, length, etc. It may not be applied to a dimension or characteristic which is primarily a structural function, such as a wall thickness, hardness, stress relieving, or corner radii. It is important to observe this distinction to assure complete consumer satisfaction.

Secondly, a fixed sample size of 75 parts is required, irrespective of the number in the lot. Whether the lot size is 200, or 2,000, or 20,000 or more, 75 parts are chosen for the sample to be checked. But every individual piece must have an equal chance with every other piece to be selected for the sample. Any method which achieves that equal chance of selection may be used. Possibly the simplest and most effective manner of selecting samples is to lay out the lot in a convenient manner (in rows if pieces are large or individually boxed, or in rows of boxes, or kegs or piles). If a container has 100 units in a box, assign numbers 1 to 100 to the first box, 101 to 200 to the second box, etc. It must be possible to identify each piece to the end that each such piece may have an equal chance of being chosen.

Numbers for each sample to be chosen to make up the total of 75 may be easily secured from a publication "Tracts for Computers," Volume XXIV by M. G. Kendall and B. Babington Smith, which contains tables of random sampling numbers. Or if that is not available, one may take the last two digits from a few columns of a 5- or 6-place table of logarithms.

Step Three is to present each dimension of each part in the sample to its respective fixed-type gage. Assume for a moment that ten dimensions are involved, which means 10 GO checks and 10 NOT GO checks for each part, 750 GO and 750 NOT GO for the entire sample. If the lot is to be accepted, every part must pass every test, i.e., 75 parts must pass the 1500 checks. But what if only three parts are rejected by the NOT GO Gage for just one dimension? Must the lot be thrown away? Must the 20 checks be made on every part of the entire lot? Not at all; this plan is much more helpful than that. If you find one or more of the 75 parts fail to pass the GO or NOT GO gage, the entire lot must be checked for that particular characteristic at that limit of the tolerance.

There are many instances where economy in



(Fig. 2. Binomial Probability Form.)

manufacture or in purchasing results in infrequent receipt of fairly large quantities of a particular part. For example, 20,000 bolts to a given part number may be required per year. Two lots of 10,000 each are received every six months. One lot is nearly gone before the next lot is received. In such an instance, the lot should be broken up into smaller quantities for sampling inspection; for example, the 10,000 parts might be split into five lots of 2,000 each. Then 75 sample pieces should be selected from each lot of 2,000, following the plan previously described. The primary purpose of such a program is not to increase the sample size, although admittedly it does that. It is to allow for the possibility of screening some of the smaller lots so that the relative number of off-tolerance pieces in the mixture of the entire lot will be reduced to a level that will assure good assemblies.

Step Four is an aid to efficiency in the culling or screening operation which is required when any rejects are found in sampling. A technique which we might call "BIPP Check for Minimum Rejects" discloses the least number of rejects which one should find in a lot as determined from the GO and NOT GO check of the sample of 75 parts. Technically it is known as obtaining the lower 90 percent confidence interval of the true percent defective of the lot. This plan makes use of a Binomial Probability Paper designed by Mosteller and Tukey and is available commercially. Four simple steps as outlined in Fig. 2 are all that are required.

Thus, were 72 acceptable parts and 3 rejects to be found in a sample of 75 from a lot of 4,500, at least 45 such rejects in the lot should be expected, including the three in the sample. This minimum

number should be found to be correct in the long run, some nineteen out of twenty times, and experience has shown that the result in that twentieth time is usually not far off. It should be mentioned here that at times the first screening discloses fewer than this BIPP number of rejects. When this has happened, a re-screening has disclosed other parts which should have been rejected.

The plan outlined has proved exceptionally economical and effective on incoming lots containing less than 0.5 percent of rejects on each characteristic. It is obvious that the presence of an increasing number of rejects will call for more and more screening and that affects the economical phase. Should such incoming rejects run as high as three percent, nine out of ten lots will require screening for the offending characteristic. There are many more sampling plans, and many other effective uses of statistics in quality control.

Acknowledgments

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W. I. Wilt, The Sheffield Corp.

Bibliography

American Gage Design Standards CS8-51, available from Supt. of Documents, U.S. Government Printing Office, Washington 25. D.C.
Unified and American Screw Threads ASA B1.1-1949, available from American Standards Association, American Society of Mechanical Engineers or the Society of Automotive Engineers.
Screw Thread Gages and Gaging ASA B1.1-1951, also available from ASA, ASME or SAE.

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Seated, from left: Donald N. Berry, Warren V. Prince, Edward A. Smith, Thomas J. Donovan, Jr., and Ben Hazewinkel. Standing: Arthur M. Hoagland, Jr., Eugene Lapin, Peter Carter, Edwin L. Cutler and Nevin C. Byrd.

San Gabriel Valley Newest ASTE Chapter

By Nancy L. Morgan

ASTE ranks were swelled by 143 new members when the San Gabriel Valley chapter received its charter on April 13. The chartering ceremonies, with National Director Tom Donovan officiating, highlighted a dinner meeting held at the Rainbow Angling Club in Azusa. More than 170 members and guests were on hand for the program, including visiting officers from the Los Angeles and Long Beach chapters.

Officers of the 95th chapter of the Society are: Edward A. Smith, chairman; Peter Carter, first vice chairman; Arthur M. Hoagland, Jr., second vice chairman; Nevin C. Byrd, secretary; and Donald N. Berry, treasurer.

Ben J. Hazewinkel, national director, gave the chairman's pin to Mr. Smith and John Stansbury, member of the national membership committee, presented the chairman's gavel.

After receiving the charter from Mr. Donovan, Chairman Smith introduced his committeemen to the membership. They include: Eugene Lapin, public relations; L. E. Gufford, editorial; Lincoln Mager, education; Edwin L. Cutler, membership; and Warren V. Prince, program.

The membership kit was given to Mr. Cutler by Wayne Ewing, area captain of the national membership committee. A congratulatory telegram to the chapter was read from A. B. Clark, who is chairman of the national membership committee.

Technical speaker for the evening, Mr. Donovan was introduced by Carl

Almquist, first vice chairman of the Los Angeles chapter, and presented his widely known 'Silver Dollar Quiz.'

Members of the new chapter are: Harry W. Arndt, Herbert S. Ayres, G. Almquist, Jr., Charles C. Adams, Elmer Button, John B. Bertoldi, M. G. Barker, James H. Banks, Lawrence Barrett, C. H. Bodner and Kenneth D. Boelter.

Ralph L. Brock, Donald N. Berry, Thomas N. Bistline, Gordon Bosworth, Nevin C. Byrd, William J. Bailey, Jr., Richard Me Betteridge, E. M. Barrett, Elliott W. Benner, John L. Blake, Harry O. Brest, George E. Carpenter, Peter Carter, Edwin L. Cutler, Marion S. Carpenter, Pliny J. Crume, Russell M. Cavin.

Other members are: Richard DePont, Arend J. Dringenberg, Lucien Dionne, Monte Denning, James Elmore, Nels Eriksson, Arthur K. Funk, Carl E. Flinchpaugh, Elmer W. Gloer, Irving Greensides, Frank J. Gallagher, LeRoy E. Guilford, Newell R. Griswold.

Leslie K. Heritage, D. G. Hadges, Harvey J. Harkless, Donald R. Hauer, Clinton W. Hetrick, Richard V. Hirsh, Arthur M. Hoagland, Jr., Robert L. Hughes, Roy Hermsdorf, Leonard E. Hulten, Virgil L. Huegel, Joseph F. Hich, Lyle E. Haber and Carl B. Ingram.

Also on the roster: Walter N. Johnson, Elmer B. Jones, Jr., Joseph G. Kleker, Noel P. Koontz, Wyatt A. King, Morris J. Kaplan, Steve S. Kozich, Leo W. Kegans, John L. Kelly, J. J. Long, W. E. Lowrence, Andrew Luptak, En-

ard W. Lundgren, Eugene Lapin, Stanley F. Lindman, Earl M. Lauderdale, William Lowrance, Jr., Lucein Lee Lyon, Stanley C. Landen and Arvel L. Larick.

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Other members: George H. Nelson, Theo Nordin, John E. Orwick, Richard J. Ortel, Enos E. Penney, Ralph R. Pierson, Leo N. Polacco, Warren V. Prince, David J. Prior, John C. Parsons, Edward F. Potter, Ivan E. Peterson, John B. Pedroni, Linwood Peterson, Carl W. Rex, Wyndall O. Reynolds, Don J. Richetts and Paul F. Ryan.

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Also on the membership roster: Fred M. Wells, Joseph S. Wajdik, Groves C. Wall, Larry G. Westerman, Edward H. Walsh, Alan G. Withall, Chris Wagner, Vard B. Wallace, Jr., A. P. Zacek and Percy Ziegler.

M. I. Schedules Metal Cutting Conference

A two-day technical conference on metal cutting, featuring several members of the Society, will open at the Massachusetts Institute of Technology, June 4, following the dedication program for the Metal Processing Laboratory.

Dedication exercises for the new building, made possible by a gift of one million dollars from Alfred P. Sloan, Jr., chairman of the board of General Motors Corp., will include a presentation address by Mr. Sloan and an address of acceptance by M.I.T. President Dr. James R. Killian, Jr.

One of the lectures on machine tool engineering and metal cutting will be delivered by Prescott A. Smith, member of the Boston chapter and associate professor of mechanical engineering at M.I.T.

Moderator for a session on thermal aspects of high-speed machining will be Orlan W. Boston, chairman, department of production engineering and professor of mechanical engineering, University of Michigan. He is a member of the Waterloo ASTE chapter.

Milwaukee member, Dr. Alfred O. Schmidt, research engineer, Kearney & Trecker Corp., will deliver a paper on "Temperature Measurements in a Workpiece, Chips, and Tool."

A paper on "Reducing Metal Cutting Research in Practice" will be presented by Dr. Max Kronenberg, Cincinnati member and consulting engineer.

Dr. William W. Gilbert, a Waterloo member, will deliver a paper on "Tool Wear as Influenced by Physical Properties of the Material Cut." He is professor of production engineering at the University of Michigan.



Elected officers of the Society met April 25 at national headquarters to discuss recommendations resulting from the 20th Annual Meeting. Pictured here, left to right, are: Dr. H. B. Osborn, Jr., third vice president; H. E. Conrad, executive secretary; L. B. Bellamy, national president; R. F. Waindle, first vice president; and J. P. Crosby, second vice president. Standing: H. E. Collins, national secretary; G. A. Rogers, assistant national secretary-treasurer; and H. C. McMillen, national treasurer.

Howe Succeeds Bergstrom in NPA Metalworking Post

Ralph S. Howe, executive vice president of the New Britain Machine Co., New Britain, Conn., assumed the duties of director of the Metalworking Equipment Division of the National Production Authority on April 15. A member of the Hartford ASTE chapter, Mr. Howe succeeds Swan E. Bergstrom, vice president of Cincinnati Milling Machine Co., who has held the governmental position for the past year.

Mr. Howe has been granted a six months' leave of absence by the New Britain firm to take up his duties in Washington.

Putnam Named Assistant Executive Secretary

Allan Ray Putnam has been appointed to the position of assistant executive secretary of ASTE. He was named to the new post at national headquarters in Detroit on May 1.

A graduate of the Wharton School of Finance and Commerce at the University of Pennsylvania he has been with the Society since September, 1949, and was previously with the American Electroplaters Society.

Mr. Putnam will continue to serve as business manager of THE TOOL ENGINEER magazine. He holds memberships in the National Assoc. of Exhibit Managers, National Industrial Advertising Assoc., and the American Marketing Assoc.

Wichita Members Report on Exposition

Wichita—The Banquet Room of Wolf's Cafeteria was the scene for the April 9 meeting of the Wichita chapter of ASTE. Reports on the Industrial Exposition were presented by Hazen Dool, Harold Bales and A. A. Reddy, three of the 24 Wichita representatives who attended the Chicago show in March.

Eighty members and guests were on hand for the technical session on "Micro Switch Uses Unlimited" presented by Tom Ryan of the Micro-Switch Co. He told of the varied industrial and home uses of his company's products, including linotype machines, automatic presses, bottling machines, air conditioning units and juke boxes.

Shown at the April meeting of the Wichita ASTE chapter, from left, are: Floyd Cassidy, Micro Switch engineer; Orville Strahm, chapter chairman; and Tom Ryan, technical speaker. Standing: Leigh Iekes, Harold Bales, Hazen Dool and Milburn Ross, all past chairmen. Mr. Ryan spoke to the Wichita members on the varied uses of his firm's products.





Ben Hazewinkel (far right) conducted the installation ceremonies of the Long Beach chapter at the March 12 meeting. Shown with him are: J. H. Stansbury, delegate; L. D. Pomerantz, treasurer; L. D. Beach, secretary; C. E. Blanchard, second vice chairman; J. H. Lee, first vice chairman; and F. D. Wallace, chairman.

Student Winners Receive Contest Prizes

Elmira—Prizes were awarded to the winners of the annual students' drawing contest sponsored by the Elmira chapter at the ASTE meeting held April 7. More than 200 members and guests met at Pierce's Restaurant for the presentations, made by Francis Shepherd, who received the outstanding service pin for his efforts in promoting the contest every year.

First prize of a collegiate drawing set went to Richard Pieffer, a junior at Elmira Free Academy. Wilson McNair, a senior at Ithaca High School, won second prize and was awarded a set of drawing instruments. William Ellsworth, sophomore at Elmira Free Academy, won honorable mention.

The dinner meeting, conducted by Chairman Raymond Banfield, was preceded by a plant tour of the Hardinge Brothers firm where the visitors were shown the methods of manufacturing lathes, collets and mills. Gifts were given to all the guests from the company. Arrangements for the tour were made by Douglas G. Anderson and John McCarty of Hardinge Brothers and Edwin Bates, first vice chairman of the chapter.

Pontiac Installs Chapter Officers

Pontiac, Mich.—"Ladies' Night" and installation of new officers were combined at the March 24 meeting of the Pontiac ASTE chapter. Corsages of carnations were presented to all the guests.

Introduced by George Bryan, the officers are: Chairman Ronald J. Hayward, First Vice Chairman James E. McDonald, Second Vice Chairman H. V. Phipps, Secretary Edward T. Markham and Treasurer David Livingstone. Circuit Court Judge H. R. Holland spoke on "The Humorous Side of the Court."

Dr. Fletcher Reviews Uses of Tool Steels

Utica, N.Y.—About 50 members of the Mohawk Valley chapter attended the April 22 meeting held at the Moose Home. The technical program was provided by Dr. Stewart G. Fletcher, chief metallurgist, Latrobe Electric Steel Co., Latrobe, Pa.

Dr. Fletcher spoke on the proper and improper uses of tool steels and showed sound films on the manufacture of tool steels. A lively discussion period followed covering costs, relative machineabilities and heat treatments of the basic types of tool steels and their possible applications.

R. A. Gleason, sales engineer at Latrobe, was a guest at the meeting.

Hazewinkel Officiates at Long Beach Installation

Long Beach—The third installation of San Diego ASTE officers was held March 12 at Peter's Restaurant in Compton with National Director Ben Hazewinkel officiating. The award for outstanding service to the chapter was presented to Don Kellar.

Chairman Frank Wallace announced the following committee to serve for the coming year: C. E. Adams, constitution and by-laws; E. A. Tobler, editorial; C. B. Edson, membership; J. J. Smith, standards; L. M. Hutchison, program; D. A. Kellar, public relations; L. Boer, education; A. Brown, historian; V. F. Kearns, advertising.

The speaker of the evening, E. C. Polidor of the Engineers Specialties Division, was introduced by William MacKay and spoke to the chapter on the advantages and merits of gaging and inspection by optical methods.

Saginaw Valley Members Hear J. A. Cupler Speech

ASTE members of the Saginaw Valley chapter heard a talk on the technique of micro-drilling at the April meeting. Program speaker for the evening was J. A. Cupler, president of the National Jet Co., Cumberland, Md.

With colored slides for illustration, he discussed the various types of equipment, feeds and speeds and cutting tools used in micro-drilling.

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Emphasizes Present Role of Tool Engineering

Garden City, N. Y.—After the installation of Long Island ASTE officers at the Garden City Hotel on March 10, G. T. Willey, vice president and assistant general manager of Glenn L. Martin, spoke on "Trends in Aircraft Manufacture."

Mr. Willey said that manufacturing in all fields, from clothing to aircraft, realizes from time to time that it must evolve better methods to further its productive capacity and more economical use of man-hours. This trend is dealing now with the man in the shop, the product engineer, the tool engineer and the production engineer.

"The man in the shop," he said, "is receiving ever-increasing attention as he is the one who actually produces the product, however it is designed. To be able to intelligently design a part or product which can be made and must be made economically, with maximum quality and speed required of present-day production, the designer must originate a design in cooperation with tooling and production engineers. Working accurately and with sound evaluation of a design will prevent rework and consequently lost man-hours due to engineering changes."

The tool engineer's responsibility is the economical and sound production design of tools which must serve the man in the shop to make or assemble the product engineer's design. This close relation of tooling and shop is coordinated by the production engineer whose problem is working with the shop, product engineers, tool engineers, and outside vendors to establish economical production lines, methods and schedules to meet delivery dates.

John Eacock Sick

Office manager at Society headquarters in Detroit, John S. Eacock has been hospitalized since early April at the Cleveland Clinic Hospital, 2050 E. 93rd Street, Cleveland, O. Letters to him should include his room number, 212.

Des Moines officers for the 1952-53 year were installed at the March meeting with First Vice President of the Society, Roger F. Waindle (far left) conducting the ceremonies. Picture, from left, are: Chairman Howard E. Campbell, First Vice Chairman G. F. McMaster, Second Vice Chairman John Hug, Treasurer R. G. Eldridge and Secretary Frank W. La Mae.



Meeting at national headquarters of ASTE, research directors of several universities and leading research laboratories and officials of the Society discussed tool engineering research programs. Participating (seated, left to right) were: H. F. Pochle, assistant to director, Engineering Research Institute, University of Michigan; Prof. O. W. Boston, chairman, dept. of production engineering, University of Michigan; L. B. Bellamy, ASTE president; Prof. J. N. Edmondson, industrial engineering dept., Ohio State University; William Brown, supervisor, Battelle Memorial Institute; Dr. J. S. Owens, research dept., Champion Spark Plug Co.; and Dr. Paul Pepper, research coordinator, Ohio State University. Standing: H. E. Conrad, ASTE executive secretary; A. F. Denham, ASTE public relations counsel; Dr. W. E. Mahin, research director, Armour Research Foundation; F. W. Wilson, ASTE technical director, and M. F. Bunting, ASTE headquarters staff.

Positions Available

TOOL AND MACHINE DESIGNERS—one of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 37 W. Seventh St., Cincinnati 2, Ohio.

Whittemore Discusses Applications of Cobalt

Galt, Ont.—"Cobalt and Its Industrial Applications" was the subject of Carl R. Whittemore, chief metallurgist, Delor Smelting and Refining Co., Ltd., when he addressed more than 60 members of the Grand River Valley chapter at Mofat's Hall on April 4.

The program also included a short business session, the showing of a film on electro painting and a buffet luncheon.

Mr. Whittemore gave a history of cobalt, outlined the extent of the world's deposits, and reviewed methods of production.

Discussing industrial applications, he emphasized the properties of cobalt which allow it to withstand high stress at very high temperatures.

A discussion period afforded members the opportunity to get answers to their specific problems.

Films Featured at Des Moines Meeting

Des Moines—Verson All-Steel Press Co., Chicago, sponsored the April 16 meeting of the Des Moines ASTE chapter held at the Kirkwood Hotel. After a buffet dinner served in the Pioneer Room, three films in color were shown on hot extrusion in transmat press, tooling at Maytag, and transmat presses and tooling.

Dr. Osborn Speaks at Twin States Meeting

Windsor, Vt.—Principal speaker at the April 9 meeting of the Twin States chapter was Dr. Harry B. Osborn, Jr., national director and third vice president of ASTE and technical director of the Tocco Div., Ohio Crankshaft Co., Cleveland. He spoke to more than 100 members at a dinner meeting held at Windsor House.

With the use of slides for illustration, Dr. Osborn covered the development and the various uses of Tocco units in his address on "High Frequency Induction Heating." He explained the theory of induction heating along with its applications and limitations.

Chairman Robert Laffin presented a copy of the *Tool Engineers Handbook* to the Windsor High School. On hand to accept the book were Glendon Sykes, instructor of mechanical trades, and his most outstanding student, Stanley Crary.

Awards Made at Erie ASTE Meeting

Erie—The Sportsman's Club furnished the setting for the Erie ASTE meeting held on April 15. Nearly forty members and guests were on hand for the dinner, business meeting and technical session.

First Vice Chairman Harry M. Rudd, presiding in the absence of Walter Cebelinski, presented the past chairman's pin to Robert Wilson. Mr. Wilson gave the chairman's annual award pin to Stanley Sadoski and reported briefly on his trip to the ASTE Industrial Exposition in Chicago.

Charles Aldino of the Sperry Gyroscope Co. spoke on "Tooling for Fine Pitch Gears." He covered all the various machines and hobs necessary in the shaping, shaving, generating and inspection of gears. Slides illustrated his talk which was followed by a brief question and answer period.

Before retiring as chairman of the Pittsburgh chapter, William Bickmore (left) presented Dick Shields with an award honoring him for his many years of service as head of the human relations committee.



Technical speaker at the April meeting of the Ft. Wayne chapter was Fred Kraatz (right) of the Johnson Wax Co. He spoke on wax lubricants and their application to the metal industry. Pictured with Mr. Kraatz is Donald Welbaum. Other speakers were Sheriff Harold Zeis, who gave a brief talk on well-known criminal cases and compared policing in this country to that in England, and Ralph Didier, who reported on the Industrial Exposition. The meeting was attended by nearly 50 members and guests.

Visitors to the Canadian International Trade Fair, June 2-13, are invited to visit the ASTE Exhibit and make it their informal headquarters while in Toronto. Individual invitations have been extended to all members in the area.

The display is being co-sponsored by Canadian ASTE chapters and national headquarters. Located in the machinery and plant equipment division, the Society booth is the one used at the 20th Annual Meeting and Industrial Exposition in March. It will be staffed by chapter representatives and Cal Burke of the headquarters office.

Pittsburgh's chapter held the annual installation of officers at the March 7 meeting. William Bickmore, outgoing chairman, congratulates the chapter chairman for 1952-53, Fred Hennig. Shown with them (from left) are: Larry Brozek, first vice chairman; Robert Mason, second vice chairman, Elwood Weissert, secretary; and Frank Glenn, treasurer. Mr. Bickmore received the past chairman's pin from his successor, Mr. Hennig.



Peden Addresses Worcester Members

Worcester—Douglas T. Peden, chief research engineer, Micromatic Hone Corp., Detroit, was the technical speaker at a dinner meeting held April 1 by the Worcester chapter at Putnam & Thurston's. John E. Rotchford, first vice chairman, introduced Mr. Peden to the audience of 65 members and guests.

His talk was supplemented with the showing of a film on "Generation of Metallic Bearing Surfaces" and with an exhibition of work which had been processed by Micromatic. A one-hour question period followed the session.

Ralph Baker, delegate to the Chicago meeting of the House of Delegates held in March, gave his report to the members on the Industrial Exposition and Annual Meeting.

Martin Explains Use of Hydro-form Press

Cincinnati—K. P. Martin, assistant manager of the machinery division, Cincinnati Milling and Grinding Machine Co., was the technical speaker at the Cincinnati ASTE meeting held April 8 at the Engineering Society of Cincinnati.

Sixty members and guests attended the meeting which followed dinner served in the club dining room. A technicolor movie on Alaska completed the program.

Mr. Martin, who is in charge of the hydro-form program, explained the construction and operation of this new kind of hydraulic press for deep-drawing operations. The principal feature is a built-in cavity which serves as a universal die, thereby eliminating up to 85 percent of usual tooling required for deep drawing. The hydro-form is designed to handle a range of materials from .005 inches thick up to 1/2 inch thick steel. Slides illustrated the talk.



April was a busy month for members of the national membership committee. In addition to their regular responsibilities, they held a day-long session at national headquarters on the 26th to discuss new chapters of ASTE. Participating in the meeting (seated, from left) were: Wayne Ewing, Marvin Bunting of the headquarters staff, O. J. Onken, Dr. H. B. Osborn, Jr., third vice president of the Society; A. B. Clark, membership chairman; Harry E. Conrad, executive secretary of ASTE; H. E. Collins, national secretary; and Emil Kitzman. Standing: Dale H. Burke; F. J. Geoffroy, G. A. Rogers, assistant secretary-treasurer; and W. W. Schug.

Chicago Members Hear U. S. Tool Co. Spokesman

Chicago—Introductions of new officers and committee chairmen by Chairman Verne Leoppert and a report of the House of Delegates meeting by Dale Long opened the April 8 meeting of the Chicago ASTE chapter held at the Chicago Furniture Mart. Mr. Long expressed the appreciation of Harry E. Conrad, Society executive secretary, to the convention committees who helped make the industrial exposition and annual meeting a success.

Speaker at the technical session was A. Melnich, chief tool engineer, U. S. Tool Co., Inc., who explained in detail the operation of a #33 multi-slide machine, a horizontal cam operated press which is completely high-pressure lubricated.

Two movies and a great number of slides were shown to illustrate the various examples of work done on the multi-slide press. A camshaft bearing made of babbitt on steel was semi-formed like a pear before finish forming to have the edges close together. Ammunition clips were formed at the rate of 180 per minute. Roller chain bushings made of .124 material were cut off with a chisel point to make the edges come together after forming. Fluorescent lamp parts are made at a rate of 600 per minute. Serial number dies for tires were made at 150 dies a minute. The production of a lock seam on a tube part was shown in slow motion to give a better view of the operation.

Mr. Melnich was introduced to the audience of more than 150 members and guests by Harry Conn.

Bellamy Guest of Toledo ASTE Chapter

Toledo—National President L. B. Bellamy was the honored guest at the April 9 meeting of the Toledo chapter held at the Maumee River Yacht Club.

Technical speaker of the evening was H. H. Keever, consulting engineer, Stevenson, Jordan, and Harrison, Inc., New York, who spoke on management engineering problems. He explained the importance of close coordination between management and engineering departments to further the use of the most efficient and economical types of operation.

Pointing out that often the biggest savings are to be found in the simple things often so obvious they go unnoticed, Mr. Keever outlined examples of good and bad tooling, handling and machining practices.

Programs Feature Automatic Screw Machines

Hartford—A crowd of 300 members and guests of the Hartford ASTE chapter was on hand for the March 3 dinner meeting and technical session held at the City Club and at the Hartford Gas Co.

The coffee speaker, Leo E. Golden, president and general manager of the Eastern Motor Freight Conference, spoke on "Service Is Our Business," the early history of the trucking industry.

The technical session was presented at the Gas Co. auditorium where Edmond D. Cotton, supervisor of apprentice training for the screw machine departments, Aluminum Company of America, and Robert Simon, technical director for the firm, spoke on "Screw Machines and Operator Training."

The topic "Automatic Screw Machines" was covered March 10 at a plant tour and technical session held at the Screw Machine Division of the Underwood Corp.

Nearly 200 ASTE members studied the plant operations as they were explained by H. W. Elliott, screw machine superintendent and D. J. Crombie, assistant works manager.

Speakers at the technical session were Albert H. Schartf, executive director, Camden Machine Co., New Haven, who showed movies of modern high-speed single screw machines in action; Renee Chagnot, superintendent of the New Britain Gridley Div., Hartford Machine Screw Co., who talked on tooling for short-run production on multiple spindles automatic screw machines; and Mr. Crombie who spoke on automatic magazine feeds for secondary operations on single spindle screw machines.

A discussion of the film and a question and answer period rounded out the evening's program.

Hartford ASTE members held their installation of officers on March 3 at the Hartford Gas Co. auditorium. Pictured below, from left, are: Henry J. Gotta, second vice chairman; Henry E. Kurla, chairman for 1952-53; Henry I. Moore, past chairman, 1941-42; Robert M. Toppin, retiring chairman; Arthur B. Shea, secretary; and Omer A. Gingras, first vice chairman. Mr. Moore was the installing officer at the meeting.





Charles G. Hettech, Jr., center, was awarded a three-year ASTE membership in the Philadelphia chapter by his firm, Brown Instruments Div., Minneapolis-Honeywell Regulator Co., on his completion of a four-year apprenticeship in tool making. The presentation was made by Philadelphia's First Vice Chairman A. B. Luecke, second from right. Also pictured, from left, are: Harry Cost; Howard Gross, head of the chapter's scholarship program; and ASTE member Walter Ware.

Bellamy Addresses Hamilton's 100th Meeting

Hamilton, Ont.—The 100th meeting of the Hamilton District ASTE chapter, held April 18 at the Connaught Hotel, was highlighted by an address delivered by the Society's national president, L. B. Bellamy, who spoke to 138 members and guests on the progress and growth of ASTE.

A birthday cake was cut by Mr. Bellamy and Past Chairman C. H. Fisher in honor of the occasion.

National Standards Secretary Cal Burke reviewed the preparations being made by the Society for staffing a booth at the coming Industrial Trades Fair in Toronto.

A plant tour through the Studebaker Corp. was held earlier in the day for 70 members and their friends. R. E. Perkey, sales engineer with the firm's South Bend, Indiana office spoke to the evening audience on the V-8 engine. Slides were shown of the South Bend plant.

Also included on the Studebaker part of the program was a speech by John Kauffman, foundry engineer, and a discussion period. Assisting the speakers in answering questions were John Madacey, general foreman of the foundry, and Fred Foreman, superintendent of the machine shop.

C. F. Finkle, Studebaker's Hamilton plant manager, outlined the history and growth of the corporation which is celebrating its 100th anniversary this year.

On March 27 the chapter toured the Cockshutt Farm and Implement Co. in Brantford. Small groups were guided through the plant by specially assigned guides who explained the various machines and processes employed in mak-

ing tractors, thresher combines and other farm implements. The 120 members on hand for the visit were welcomed by J. M. Snyder. The tour was arranged by Education Chairman J. A. Sheldon and his committee. Coffee and sandwiches served in the company cafeteria completed the evening's activities.

The March 14 meeting of the chapter was held at the Brant Hotel. Retiring Chairman Yorick congratulated the new officers and introduced the installing officer, William Dawson.

A gavel made by students of the Delta Technical School was presented to the new chairman, William Shaw, and the past chairman's pin was given to Mr. Yorick.

Technical speaker at the meeting was Malcolm F. Judkins, chief engineer, High Temperature Alloys Div., Firth Sterling Steel and Carbide Corp., Pittsburgh. He spoke on the history and uses of carbides to an audience of 60 persons.

Dawson Named to Government Position

W. A. Dawson, manager of the Hamilton (Ont.) Branch of the F. F. Barber Machinery Div., Massey Harris Co., Ltd., is now government representative of the gun division of the production branch of the department of defense production at the Sorel and Longueuil gun arsenals. On loan by his company, Mr. Dawson left to take over his new duties on April 14. He is a past national secretary of ASTE and served as charter chairman of the Hamilton District chapter.

Reinvestment of Profits Increases Productivity

Philadelphia—H. Thomas Hallowell, Jr., president, Standard Pressed Steel Co., Jenkintown, Pa., presented a talk on "Increasing Productivity by Use of Greater Capital" before an audience of 150 Philadelphia members at the April 17 meeting.

Using informative graphs, Mr. Hallowell described the growth of American industry over the past 50 years. "Despite the inflationary trend during these years," he said, "our standard of living has increased in still greater proportions."

He attributed this phenomenon to ability to continually increase production, made possible by the investment of greater capital in improved machinery, tools, methods, management and human relations.

After describing the cycle of competition, production, wages, profits, taxes, savings and capital, Mr. Hallowell cited numerous examples whereby his organization has benefited from the reinvestment of profits.

D. B. Martin was the speaker at the March 20 meeting held at the Engineers Club. Sales manager of Amplex Mfg. Co., a division of Chrysler Corp., he spoke on the manufacturing process used in making powder metal products. A movie and discussion period were included in the technical program.

Appointments of chairmanships were announced by First Vice Chairman Al Luecke. They are: George Whitley, public relations; Harry Wood, editorial; Walter Phifer, finance; William Chalfont, membership; William Pinkstone, registration and reception; Ken Riddle, program.

Other posts will be filled by: Foster M. Crayton, chaplain; Robert A. Lowry, entertainment; Richard Gross, standards; Charles K. Kennig, Jr., education; Paul B. Mochel, welfare; Arthur R. Diamond, industrial relations; and Douglas Cunningham, carbide committee.

More Data Sheets Are on the Way

Because of the rapid growth of the Society (nearly 400 membership applications are processed each month), the newest members of ASTE are receiving only the most recent data sheets.

Plans are now under way to correct this situation by reproducing copies of data sheets issued under the numerical indexing system established in 1946. By having the manufacturers responsible for each sheet, provide the necessary plates for multilithing along with the initial 1,000 prints, it will be possible to increase substantially the number of sheets received by new members.



E. C. Shaw (second from left) was honored as the 100th member of the Piedmont ASTE chapter at the group's March meeting. Pictured with him (left to right) are: Chairman C. J. Rix, Retiring Chairman A. F. Moosbrugger and R. W. Miller, national membership committee representative who presented the 100th membership pin to Mr. Shaw.

Bryant Receives Cedar Rapids Award

Cedar Rapids—New officers were sworn in at the March meeting of the Cedar Rapids chapter of ASTE held at the Hotel Montrose. Installation ceremonies were conducted by W. D. Popek, retiring chairman.

Guiding activities of the chapter for the next year are: Edwin L. Klouda, chairman; Richard L. Coyner, first vice chairman; Carroll F. Bryant, second vice chairman; Elmer M. Bruce, secretary; and Frank J. Jekerle, treasurer.

The service award was presented to Mr. Bryant for his work as secretary and editor of the chapter bulletin by Mr. Popek, who was awarded the past chairman's pin by Elliott H. Wheeler. A report on the annual meeting held in Chicago was given by Mr. Coyner. Annual reports were delivered by Treasurer Jekerle and Mr. Popek.

C. A. Ragan, assistant manager, contracts division, Solar Aircraft Co., Des Moines, discussed the history and principles of jet propulsion.

Slides showing jet engines and engine parts were used to illustrate some of the problems encountered in the design and construction of jet engines. The lecture was followed by a lengthy question and answer period. The speaker was assisted by Earl Rollins, contract administrator.

First Vice Chairman Coyner conducted the meeting in the absence of Mr. Klouda.

Carbide Lecture

Tulsa—Technical speaker at the April meeting of the Tulsa ASTE chapter was L. L. DeCoster, assistant sales manager of the midwestern district, Carboly Div., General Electric Co. He spoke to more than 50 members and guests on the history and future of the carbide industry. The meeting was held at Larton Hall, on the campus of the University of Tulsa.

Honor Leon Ruch for Outstanding Service

Seattle—Installation of officers highlighted the March 25 meeting of the Seattle ASTE chapter held at the Stewart Hotel. The chapter award for outstanding service was presented to Leon R. Ruch, retiring program chairman, for his work during the past year in arranging events and providing programs for the chapter.

The annual report was delivered by Bud Coenen, outgoing chapter chairman. A short talk on the ASTE 1952 exposition was given by John Lee.

Harry L. Strauss, Jr., general manager, National Diamond Laboratory, New York, gave an instructive talk on specifications of commercial diamonds and their use and care. A discussion period followed his speech.

New officers of the Seattle chapter are: Chairman Anthony J. Gembolis; First Vice Chairman Roy A. Coady; Secretary Frank J. Stasney; and Treasurer Frank A. Schellbase.

Osborn Installs Piedmont Officers

Charlotte, N. C.—Sixty-six members and guests of the Piedmont chapter met at Pecan Grove Supper Club for installation of officers by National Director and Third Vice President, Dr. Harry B. Osborn, Jr., and a technical session.

Following the report of Retiring Chairman A. F. Moosbrugger, R. W. Miller introduced E. C. Shaw—the 100th member of the chapter. At the time of the meeting, 110 members were listed on the Piedmont roster and several applications were being processed.

Dr. Osborn administered the oath of office to the new chairman and complimented the chapter on its growth and activity since receiving the ASTE charter in December, 1949, with a membership of 55.

Paul Ostrander, sales manager of Cyril Bath Co., presented a talk on "Compression and Stretch-Forming of Modern Materials." A discussion period was held after the lecture.

Traces History of Automatic Screw Machines

St. Thomas—A dinner at the Terrace club preceded the March 27 meeting of the London-St. Thomas ASTE chapter. Nearly 150 members and guests attended the technical session which featured a talk on automatic screw machinery delivered by A. C. Wickman of the Wickman Co.

Introduced by Lou Jenson, Mr. Wickman traced the history of the automatics and pointed out how accurately a main spindle drum and component parts must be machined to produce accurate components.

Clem Weston of Hannafin Corp. had a double role at the April 10 meeting of the New Orleans chapter. He was host to members at a dinner served in the patio courtyard of his home and also provided a technical lecture on Hannafin air valves. Pictured at the meeting (seated from left) are: Treasurer A. R. Ryan, Second Vice Chairman M. P. Chatry, Chairman J. R. Cypher, First Vice Chairman L. C. McKinley and E. E. Graf. Standing: Mr. Weston, Program Chairman John Sale, Standards Chairman Arthur Hulstrand and Public Relations Chairman M. C. Ludwig.



Handbooks Awarded for Winning Questions

Copies of the *Tool Engineers Handbook* were presented to all those members who submitted prize-winning questions for discussion in the panel sessions at the 20th Annual Meeting in Chicago. In addition to those named previously, the following questions were entered in the contest and won *Handbooks* for their authors. Answers to these and many other practical questions are given in the printed panel discussions now ready for distribution.

E. J. Druan, Jr., Boston member, asked "Of all the methods devised for operator protection on punch presses, what do you believe to be the most practical and why?" His question was answered at the panel on metal stamping dies and operations.

Another winner, Stanley Forritt of the New Haven chapter, asked "What is the status of interchangeability in the industry? We have reduced the inventory of complete dies in use by stocking spare parts on a completely interchangeable basis. Die parts are detailed with tolerances in tenths just the same as fine machine parts. It pays off by cutting down time, after a smash, from weeks to hours. More importantly, all dies produce exactly the same product regardless of how many times they are rebuilt. In addition, specialists can do 90 percent of our die work."

Akron member E. S. Mikis submitted, "Can multiple similar $\frac{1}{8}$ x $\frac{1}{4}$ -inch rectangular slots be punched with a pitch of 0.3125 inches in 0.008-inch $\frac{1}{2}$ H sheet brass on number 1020 sheet steel to a pitch tolerance of 0.0005 inches? What might be the closest practical pitch tolerance for such work?"

At the panel on finish grinding, A. H. Schmitt of the Detroit chapter asked "What are the chances for success on the following problem? Triangular-



Members of the Buffalo-Niagara Frontier chapter toured the stamping plant of the Ford Motor Co. at their April 10 meeting. More than 350 were on hand for the tour and the dinner and business session which were held in the firm's cafeteria. Pictured here, left to right, are: W. J. Reich, John B. Kendall (plant manager and host for the visitation), W. L. Clarke, W. J. Iekel, C. Oliver and R. S. Slate.

shaped pieces are to be wet ground on a surface grinder. Blanks are made of sheet steel $\frac{3}{64}$ inches thick; sides are approximately $\frac{5}{8}$ inches long. Pieces are hardened and tempered to approximately Rockwell C60. We propose to hold these blanks in a double row of 25 or 30 on a magnetic parallel resting on a magnetic chuck. They have to be ground down to a thickness of 0.025 inches. The important thing is to get the finest finish possible on both sides of the blanks and retain absolute flatness. Can this result be hoped for with blanks ground down so thin? What about heat warping during grinding?"

Toronto chapter member Maurice Conklin asked, "Why can't grinding do what lapping and honing operations do?"

From B. H. Pohlmann, Los Alamos member, came this question: "What is the relationship to date of the ability of the grinding equipment (wheels and machines) to the advanced methods of inspection? In other words, has grind-

ing advanced in the same proportion as modern equipment has for checking it?"

At the drilling panel Maurice Conklin of the Toronto chapter asked "Below the center of a drill is a circular area of web thickness in diameter (sketch submitted) which is not touched by the lips of the drill. What is the metal removal action here?"

Peoria member J. J. Barnakee submitted "What is the future of the use of carbide-tipped drills for general use? Can you give some speed and feed data and tool life figures in regard to carbide-tipped drills?" Another winner was Robert Frechman, Greater New York chapter, who asked "What is the best method of drilling stainless steels, (Type 403), lubricant required and surface speed?"

(Continued on page 86)

Outstanding Service Pin Presented to Miller

Dayton—Russell Miller was honored for his outstanding service to the Dayton chapter at the March 10 meeting when Retiring Chairman Larry McAfee presented him the honorary chairman's pin for his support of the chapter and his work with the junior ASTE group in Dayton.

National Director George Goodwin installed the new officers and awarded the past chairman's pin to Mr. McAfee and presented the chairman's pin to Richard Blair.

The subject of machining steels, jet engine alloys and titanium with carbide tools was covered at the technical session by Norman Zlatin, Metcut Research Associates, Cincinnati. Attendance at the meeting was about 65 members and guests.

National Director George Goodwin (extreme right) was the installing officer at the March 10 meeting of the Dayton chapter. Shown with him, from left, are: Richard Miller, first vice chairman; Roy Duseau, second vice chairman; Richard Blair, chairman; William Lawrence, secretary; and Vic Bohl, treasurer. Russell Miller was honored at the meeting for his outstanding service to the chapter and his work with the junior ASTE group.



Curtiss Discusses Production Problems

Washington, D. C.—Myron S. Curtiss, director of engineering, Warner & Swasey Co., addressed the April 3 meeting of the Potomac chapter on "Wealth, Production and Machine Tools." The session was held at the Hotel Hamilton.

Stressing the relationship of wealth to productivity, Mr. Curtiss pointed out the many difficulties confronting a tool manufacturer: "the boom periods when surplus machine tools are manufactured and the contrasting slack phases when the surplus tools are diverted to less demanding projects, the lack of concerted action resulting from the individualistic nature of machine tool industries; trouble in finding skilled help when a boom period develops, and tax misunderstandings that prevent a balanced continuity from being maintained."

"Machine tools never wear out, they become outdated," Mr. Curtiss said. "Greater accuracy is demanded, higher production and fool-proof operation are necessary. Machining time is reasonably close to the desired stage. It now remains to perfect the handling time to achieve the required production."

Golden Gate Chapter Hears E. Von Hombach

San Francisco—"Fabrication of Stainless Steels" was the topic of E. Von Hombach, research and development engineer for the Carpenter Steel Co., Reading, Pa., when he spoke to members of the Golden Gate chapter at the April 16 meeting.

More than 100 persons were present for his lecture which was augmented with slides. A lengthy question and answer period closed the meeting.

Al Minetti (far left) administers the oath of office to Golden Gate chapter's Chairman Ted Rohrer, Second Vice Chairman Dean Roulund and Secretary Jack E. Moeller. Other chapter officers for the coming year are: Dave Gustafson, first vice chairman, and Kerian Shomber, treasurer. The installation ceremonies followed dinner served at Bellini's Restaurant in Oakland. Paul Pick was awarded the outstanding service pin.



Potomac's ASTE chapter combined Ladies' Night and installation of officers at its March meeting held at the Hamilton Hotel. The 'Silver Dollar Quiz' was presented by National Director T. J. Donovan, Jr., (far right), who was the installation officer. Chapter officers are: Chairman W. E. Jones, First Vice Chairman George M. Cohn, Second Vice Chairman Eugene S. Parsons, Secretary, W. F. Heffernan and Treasurer James M. Cole. Music, refreshments and corsages were provided by George E. Viereck Co., Riverside Tool and Engineering Co., William E. Summerbell Co. and J. H. Elliott Co.

Chapters Hold Joint Meeting on Quality Control

Poughkeepsie, N. Y.—Members of the Mid-Hudson ASTE chapter and the Mid-Hudson Section of the American Society for Quality Control held their annual joint meeting at Smith Brothers on April 22. Approximately 75 persons heard Paul Clifford, associate professor of mathematics, Montclair State Teachers College, Montclair, New Jersey, speak on "Application of Quality Control for the Tool Engineer."

"The quality engineer," Prof. Clifford said, "is concerned with making the present product better and at less cost and with the design of quality and studying of new products. Every process or operation is subject to certain variables which are admitted by the drawing tolerances. These variables can be of a multiple nature such as variations in raw materials, more than one machine producing the same part, gages not alike and gradual changes to tool size due to wearing."

He said that under the previous system of inspection, where parts were not checked until the complete lot was finished, 100 percent rejection was possible through any one of the variables. Quality control by its methods of first piece inspection, subsequent periodic checks and the plotting and analyzing of these checks assure an in-tolerance condition of the parts as they are produced.

Quality control charts, located where the operator can readily see the pattern of the work he is producing, Prof. Clifford said, creates a psychological effect which is conducive to better work.

He explained the sampling method including the single, double, and multiple plans, noting that while a certain percentage of defective parts is allowed in each lot, this percentage should not be consistent in every lot. Such consistency is an indication that adjustments are necessary at some point.

Al Minetti presents the past chairman's pin to Ben Berlien at the March 19 meeting of the Golden Gate chapter. The technical program was provided by E. C. Polidor who spoke on optical projection.



St. Louis Executives Honored by ASTE Chapter

St. Louis—The annual "Executives' Night" staged by the St. Louis chapter was held March 13 and drew an attendance of more than 415 members and guests.

Dinner served at the DeSoto Hotel opened the evening's activities. Retiring Chairman L. W. Greenblatt welcomed the ASTE guests on behalf of the chapter.

A history-making event for the St. Louis chapter was the awarding of two one-year scholarships, fully paid, to students at St. Louis University and Washington University. The first such awards the chapter has made, the 1952 scholarships were accepted by Father Blume and Professor Tucker for their respective universities.

A short talk on the ASTE Industrial Exposition was given by J. J. Demuth, immediate past president of the Society, who administered the oath of office to: Chairman E. P. Huchzermeier, First Vice Chairman W. J. Potthoff, Second Vice Chairman I. Schumaier, Secretary L. Slager, Treasurer H. O. Monohan, Mr. Greenblatt presented the service pin award to Willis J. Potthoff.

The past chairman's pin was presented to Mr. Greenblatt by Mr. Huchzermeier.

The main speaker on the program was Dr. W. R. Alexander who spoke on "Our Moral Needs," an informal talk on religion, government and politics.

Buffalo-Niagara Frontier Chapter Tours Ford Plant

Buffalo—A dinner and plant tour of the stamping plant of the Ford Motor Co. attracted 350 members and guests of the Buffalo-Niagara Frontier ASTE chapter to the April 10 meeting.

The group was welcomed by John B. Kendall, plant manager, who conducted the visitors through the stamping plant after a dinner and business session held in the company cafeteria.

Installing officer at the March 11 meeting of the San Diego chapter was National Director Ben Hazewinkel (extreme left). Shown with him, from left are: Clarence LaCourse; C. F. Boyle, treasurer; W. E. Stelmach, secretary; D. R. MacGregor, second vice chairman; Art Guzinski, first vice chairman; and A. E. Crom, chapter chairman. The outstanding service pin of the chapter was awarded to Gordon Gray.



St. Louis ASTE officers were installed by J. J. Demuth (far right) at the March 13 meeting held at the DeSoto Hotel. More than 400 persons witnessed the inauguration of (from left): Treasurer H. O. Monohan, Secretary L. Slager, Second Vice Chairman I. Schumaier, First Vice Chairman W. J. Potthoff and Chairman E. P. Huchzermeier. Another outstanding event of the evening was the awarding of two fully paid one-year scholarships.

Applied Hydraulics Discussed in Toronto

Toronto—"Applied Hydraulics" was the technical topic discussed at the April meeting of the Toronto chapter held at the Oak Room, Toronto Union Station. Guest speaker was Fred Gieryn, district manager, Vickers, Inc.

Dividing the talk into three sections with question periods in between, Mr. Gieryn used schematic diagrams to illustrate the hydraulic systems required for hydraulic presses, machine tool feeds and reciprocating table feeds.

"Overheating in hydraulic systems is usually due to improper setting of check valves," he said, "and may also be caused by the use of piping, rather than tubing, for conduits. In addition to being smoother, thereby reducing friction, conduits made from tubing are usually free from scale and dirt."

Mr. Gieryn recommended the use of specially compounded hydraulic oils and advised that due to the pressures encountered in such systems, steel fittings should be used rather than brass or other non-ferrous types.

The speaker was introduced by Cliff Farr. The appreciation of the chapter was extended by Bruce Fairgrieve.

On April 4 the ninth annual Ladies' Night was held at the Royal York Hotel in Toronto. Nearly 500 couples attended the party.

Bacik Appointed Program Secretary

Richard J. Bacik, associated with the Society since January of this year, has been named secretary to ASTE's national program committee, reporting to Frank Wilson, technical director. Formerly a member of the sales staff of the Sun Oil Co., he joined the headquarters staff to assist in preparation for the Industrial Exposition.

Gordon Gray Receives San Diego Service Pin

San Diego—Gordon Gray was awarded the outstanding service pin for his enthusiastic support of the San Diego chapter of ASTE at the group's March 11 meeting held at the El Morocco Club. Installation of officers for the coming year by National Director Ben Hazewinkel rounded out the business portion of the meeting.

Technical speaker E. C. Polidor, Engineers Specialties Division of Long Beach, spoke to the chapter on "Inspection by Optical Projection Methods."

The fifth annual dinner dance was held March 22 at the El Morocco.

Obituary

Warren H. Turner

Warren H. Turner, 51, district sales engineer in Michigan for the Norton Co., died in Detroit March 13, following an illness of several months.

Mr. Warren had been with the company for 31 years. His first job was in the research laboratories. The years later he was appointed field engineer in the Worcester area, and remained in the position for eight years. He spent a short time in Detroit before serving as an abrasive engineer in southern California. In 1945, Mr. Warren was assigned to the Michigan area.

A member of the Detroit chapter of ASTE, he also held memberships in the Engineering Society of Detroit and the American Foundrymen's Society.

Movies on Multipress Shown at ASTE Meeting

Kansas City, Mo.—More than 50 members of the Kansas City chapter attended the dinner meeting held April 2 at Roselli's Restaurant.

Melvin G. Sulser, regional supervisor, Denison Engineering Co., Columbus, and R. H. Bass, head of sales engineering activities in the St. Louis area, presented two films on "Firepower Production" and "Multipress and How You Can Use It."

The films illustrated the versatility of the multipress for pressing operations. Numerous high-speed assembly operations using the built-in indexing table along with a large variety of simple and complex tooling were shown. Parts and assemblies actually run on these machines were exhibited after the films and a short discussion period was held.

The annual dinner dance and installation of officers held on March 5 was attended by more than 300 members and guests. W. W. Mason received the outstanding service award from Retiring Chairman Ivan Nelson.

New officers of the chapter are Chairman John W. Hoover; First Vice Chairman, Jack T. Needham; Second Vice Chairman, Merlin R. Grundy; Secretary, Harold W. Buddenbohm; and Treasurer Gerhard J. Schroer. They were sworn in by A. Jack Merrick.

Appointed Vice President

Alvin H. Haas, president of Bud Radio, Inc., Cleveland, has announced the appointment of Robert Hamburger as vice president in charge of production. A Cleveland ASTE member, Mr. Hamburger had been with Bud Radio since 1947. Before that he served as assistant shop engineer with White Motors Co., production manager with Glove Machine & Stamping and plant superintendent of Eberhard Mfg. Co.



RALPH CROSS

Rollins Addresses New Haven Chapter

New Haven, Conn.—The April meeting of the New Haven ASTE chapter was held at the Hotel Garde where a group of nearly 50 members and guests gathered for an informal dinner. Chairman John Alton conducted a short business meeting which was highlighted by the report of Retiring Chairman David Mathewson.

Preparations for 'Connecticut Night,' co-sponsored by New Haven, Fairfield County and Hartford ASTE chapters, were reviewed by Frank W. Gilbert, program chairman, who introduced the speaker of the evening.

Walter E. Rollins, Brown and Sharpe Mfg. Co., Providence, R. I., gave a lecture and showed movies of high-speed automatic screw machines and high-speed attachments.

Graham Promoted

Neill S. Graham has been named vice president of the Grobet File Company of America, Inc., according to an announcement by the firm's president, J. M. Robert. Mr. Graham will continue to be in charge of the Chicago branch of the company.

Detroit Executive Speaks on Production

Rockford, Ill.—Current production of machine tools and how it influences the American way of life was the subject covered by Ralph Cross, executive vice president, Cross Co., Detroit, at the April 10 meeting of the Rockford ASTE chapter held at the Lafayette Hotel. Included on the program, designated as 'Bosses' Night,' was a coffee speech delivered by Arthur Logan, secretary of the Winnebago County Civic League, on "Hidden Taxes."

"Machine tools are truly the seed corn of production," Mr. Cross said. "Without them, the necessities of life and the luxuries of a comfortable existence would not be available for better living. People must have, therefore, the means of production—machine tools—for production and machine tools are at the foundation of our highest form of civilization."

He explained that when all Americans understand the importance of machine tools, the need for production, the need for savings and the need for investment, as well as the motivating force behind the whole picture, then they will understand the 'American Doctrine of production for Better Living.'

At the March 13 meeting of the chapter, also held at the Lafayette Hotel, Harry E. Conrad, executive secretary of the Society, spoke to the Rockford members on the growth of ASTE and the Industrial Exposition, and installed the new officers of the chapter.

Technical speaker at the meeting was R. Y. Case, general manager, Timing Belt Div., L. H. Gilmer Co., Philadelphia, who spoke on timing belt drives.

Explains Use of Microwave System

Baltimore—An informative report on the ASTE Industrial Exposition and Annual Meeting was given by Delegate John Schukraft at the April 12 meeting of the Baltimore chapter. He reviewed the proceedings at the House of Delegates meeting and described the displays and exhibits at the International Amphitheatre.

Chairman Leon Laux also gave a brief summary of the Chicago convention.

The technical speaker, Chauncey R. Tatum, commercial supervisor of public relations, Chesapeake and Potomac Telephone Co., presented an interesting discussion on the various media used for handling intercity television programs. The microwave relay system was demonstrated with a laboratory model. The relationship between light and radio waves was shown and samples of various types of cables were displayed.

Officers of the Fox River Valley ASTE chapter were inaugurated at the March meeting of the group. Installing officer was George Bodi, retiring chairman and delegate. Men who will be guiding chapter activities during 1952-53 are shown with him. From left: Chairman George Parsons, First Vice Chairman Phil C. Shaner, Secretary Charles A. Olson, Second Vice Chairman Donald E. Zierk and Treasurer Willard C. Perkins.



West Coast News

By Andrew E. Rylander

April 16th, attended Golden Gate chapter's meeting at the El Jardin Restaurant, San Francisco, where E. Von Hambach, research and development engineer for Carpenter Steel gave a talk on "Fabrication of Stainless Steel." He not only knows his stuff from A. to Izard but presents it so that you go away plenty wiser for the listening. I'd be glad to hear him again. Met Walter Kassebohm, past national director, a few meetings ago, but he got away before I had a chance to say more than "hello." Oh well, there's always another time.

On April 9th, went down to San Jose to lend moral support to organization of a new chapter although, as for that, arrangements had been quite satisfactorily worked out by such live wires as Carl Horack, E. F. (Rock) Roskowski, and Vincent Diehl, the latter elected temporary chairman pending application for and granting of charter.

Others elected pro-tem were Wm. C. Lanyon, mfg. engineer, Westinghouse Electric Corp., 1st v.c.; Mr. Roskowski, tool engineer with Food Machinery & Chemical Corp., 2nd v.c.; Rob't. D. Harper, tool engineer, Hiller Helicopter Co., Treas.; Wm. A. Ware, tool engineer, Westinghouse Electric, and Carl Horack, M. E., Westinghouse Electric, adviser. Of this group, Diehl, Roskowski and Horack are senior members of Golden Gate chapter.

Turnout was surprisingly good in view of heavy rain and thunder, the latter—not rain!—a rare occurrence in California. Of the 75 or so representatives from various local industries who attended, all present evinced intention of joining the ASTE, all of which augurs well for the future of tool engineering on the Coast. Anticipating flooded roads, I didn't wait for a count of applications, but understand that the temporary officers are hard at work lining up the required membership.

G. W. Leineke was chairman of the April 17 plant tour of Vickers, Inc., taken by the student group of the Detroit chapter. The members pictured below also heard a talk by E. O. Clark, sales manager.



Getting around—thanks to friends!—had the pleasure of visiting Gaylord Thompson, who is building a novel type of turret lathe down in Redwood City. We'd met on and off at ASTE conventions, but what surprised me was that he still had on file letters from me written 10 years ago or more. Oh, well, I've written a lot of letters in my time.

Also, had the privilege—and I mean privilege! of visiting Dalmo-Victor Company's No. 4 plant in Belmont, where a young chap named Cazmo Lukrich—shop superintendent—has put plenty of outstanding ideas to work. The plant building itself is unique in that some 4-score redwood louvered storm windows have been incorporated in the masonry walls to provide both ventilation and protection against inclement weather.

Plant layout is on an unusually high order, with few if any details overlooked to get the most out of excellent equipment and tooling. As for that, young Lukrich is a "natural" tool engineer with plenty on the ball, apropos which I hope to see him a member of Golden Gate chapter in the near future. This is a second invitation already extended by Al Minetti, popular past-Chairman of G.G. chapter.

About all for now a/c I'm readying for a trip to Utah State Agricultural College, this in response to an invite from Prof. Frederik Preator to attend the Spring meeting there. Will tell you all about it in the July issue. Now, in closing, I want to correct a misconception about California that seems to exist in the minds of some easterners.

That is, that the cattle and horses seen browsing around these dome hills that prevail throughout California do not develop short legs on one side as commonly supposed. They even up the wear and tear on underpinning by reversing direction of rotation. Let that be the nature lesson for today.

Coming Meetings

BINGHAMTON—June 13, 7 p.m. Statler Hall, Ithaca. "Jig Fixture Work" and "Ground Dies" by Alanzo C. Good and E. E. Becholt, National Cash Register Co., Dayton.

CHICAGO—June 7, 10 a.m. Annual golf tournament at Silver Lake Golf Club. Dinner will be served after tournament.

CLEVELAND—June 20. Annual golf party at Manakiki Country Club, Willoughby, Ohio.

DES MOINES—June 18. "New Metals" by B. A. Rogers.

DETROIT—June 5. Carbide Section: "Future Developments in Carbide."

LOS ANGELES—June 12. Plant tour, AiResearch Mfg. Co., 5907 W. Imperial.

MUNCIE—June 3. Plant tour, RCA Victor Div., 3301 S. Adams St., Marion, Ind.

PHILADELPHIA—June 7. Annual picnic at Philadelphia Rifle Club.

PITTSBURGH—June 6. Annual picnic at Daniel's farm on McKnight Rd.

SPRINGFIELD (ILL.)—June 3. "Presses Geared for Automatic Production" by W. W. Schug, general sales manager, V & O Press Co., Hudson, N. Y.

Situation Wanted

TOOL DESIGN SUPERVISOR with thorough knowledge of tool design for aircraft, fabricated structures, welded tubular structures and with optical tooling and small tools experience is available for attractive proposition, preferably western U.S. or Canadian aviation industry. B.S. degree, experienced in teaching engineering subjects. Willing to travel, as salesman, service, etc. Write Box 120, THE TOOL ENGINEER, 10700 Puritan Ave., Detroit 21, Mich.

Prize-Winners

(Continued from page 82)

Mr. Tilles submitted another prize-winner for the machine drives and controls panel. "What type of machine drive have you found to be most satisfactory from a maintenance point of view?"

H. M. Fraga of the Los Alamos chapter asked "What company, if any, makes a variable-speed drive with automatic controls that will maintain a fixed surface-feet-per-minute cutting speed for a lathe, in an operation such as facing a large piece? How does it work?"

Robert Rubenstein from Chicago's ASTE chapter submitted "Can electronic drives be used for synchronization of a multi-drive machine?"

News in Metalworking . . .

INTERNATIONAL STANDARDS BODY TO CONVENE

Representatives from most of the national standards organizations of the 33 member countries will descend on Columbia University this month for the two-week triennial meeting of the International Organization for Standardization. The American Standards Association, U.S. member of the ISO, will act as host. The ISO is the international clearinghouse for the national standards bodies of most industrial countries. It also is recognized by the United Nations as the authoritative channel through which standardization on an international level is carried out.

Sixteen technical committee and subcommittee meetings also will be held during the session, and a number of technical problems of international concern are scheduled for attention. These will include standards for bolts and nuts, ball and roller bearings, iron and steel, machine tools, mica, petroleum products and textiles. Efforts of the committees will be bent toward reaching agreements which will iron out differences in national standards of the various countries.

At this time, too, the ISO Council, executive body of the organization, will meet to act on questions concerning the constitution, election of officers, membership, finances and general policy. The General Assembly will act on questions of policy and procedure referred to it by the Council.

SHORTENS NAME

Texas Engineering and Manufacturing Co., Inc. has announced the shortening of its name to Temco Aircraft Corp. The new name is considered more convenient for customers, suppliers and other business associates.

NEWCOMER GROWS

Newcomer Products, Inc., of Latrobe, Pa., officially opened its additional plant production building recently, marking the event with a party for plant employees, sales personnel and company officials.

The single floor structure adds approximately 400 percent additional production capacity to help meet the company's growing operations.

At the same time, William Newcomer, president of the firm, said that ground has been purchased and plans approved for yet another addition to be started almost immediately, and which, when completed during 1952-53, will more than double present capacity.

CARBOLOY ADDITION BEGUN

Construction of a new permanent magnet manufacturing plant which, with its equipment, will cost more than \$3½ million is under way in Edmore, Mich., for the Carboloy Dept., General Electric Co. The new plant, comprising 90,000 square feet of space, will increase substantially the current manufacturing facilities. Completion is expected sometime during early 1953.

FIRTH STERLING RENAMED

The name of Firth Sterling Steel & Carbide Corp. was changed to Firth Sterling, Inc., at the company's recent annual meeting of shareholders. According to K. D. Mann, president of Firth Sterling, this was done because the nature of the business has broadened to such an extent that the former name was no longer descriptive of the range of products now being produced.

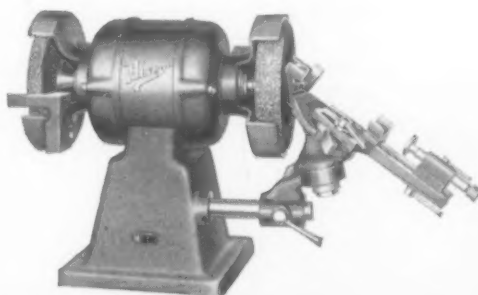
Are you having TROUBLES in your DRILL DEPARTMENT?

Following are some of the most common and their causes:

Trouble	Cause
Oversize holes.	Unequal lip length.
Drill burns—will not cut.	Insufficient clearance.
Cutting edge chips or crumbles.	Too much clearance.
Outer corners of lip break down.	Speed too High.
Excessive wear on margins.	Speed too slow or
Rough holes.	Feed too heavy.
Drill breakage.	Dirt or chips in socket or
Drill point crushes.	worn out socket.
Broken tangs.	

Most of the above can be overcome by using a precision type Drill Grinder. A Hisey Drill Grinder will quickly pay for itself when you consider that drills that are correctly ground and kept sharp will (1) drill faster, (2) drill more holes per grind, (3) drill to exact size, (4) reduce breakage, (5) increase life of drill by removing less metal when sharpening.

A Hisey Drill Grinder will grind drills quickly and correctly with inexperienced operators.



ASK FOR CATALOG 71 EP

It shows more than 200 different types and sizes of Bench and Pedestal Grinders, Buffers and Polishers, Snagging Grinders, Lathe type Grinders, Wet Tool Grinders, Disc Grinders and Dust Collectors.

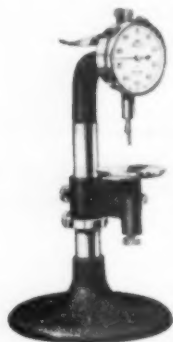
Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO
Division of The Cincinnati Electrical Tool Co.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-87

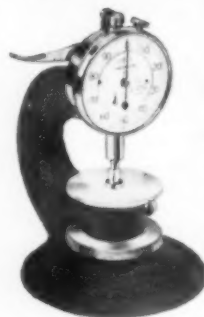
FOR *Strictly* IMPERSONAL INSPECTION CHOOSE **AMES** DIAL COMPARATORS

Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy — the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

Check the Ames Dial Comparators shown — one of them may solve a Quality Control problem for you.



Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.



Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials — sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.



Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.



Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

Representatives in principal cities. **B. C. AMES CO.** 30 Ames Street Waltham 54, Mass.
Mfrs. of Micrometer Dial Gauges • Micrometer Dial Indicators

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-88

LAPOINTE OBSERVES GOLDEN YEAR

This year Lapointe Machine Tool Co. is marking its fiftieth anniversary. And simultaneously, it's celebrating the golden anniversary of broaching, the industry it helped pioneer.

From a modest beginning in 1902, Lapointe has maintained its growth so steadily as to keep continuously in the lead as a manufacturer in the broaching field, as well as concretely furthering the work with its activity in development of new methods and the production of broaching machines, fixtures and tools. Milestones in this latter direction included the introduction in 1902 of what is claimed to be the first screw-type broaching machine; and in 1923 of a broach sharpener that enabled the ordinary shop to do its own broach sharpening. Two years later Lapointe developed a machine to handle primary operations, particularly on malleables and forgings, and in 1941 it originated an automatic indexing and turret machine to handle multiple operations and multiple cuts.

During the war years the company's reputation increased through the engineering know-how of its specialists who helped considerably in the production effort, often being assigned to war production plants where their work and suggestions were responsible for the greater quantity of weapons delivered on time.

Instances like these make Lapointe understandably proud to take time out and celebrate on this fiftieth year.

LATROBE CHANGES NAME

Corporate name of Latrobe Electric Steel Company has been changed to Latrobe Steel Company according to an announcement released recently following the company's annual shareholders' meeting.

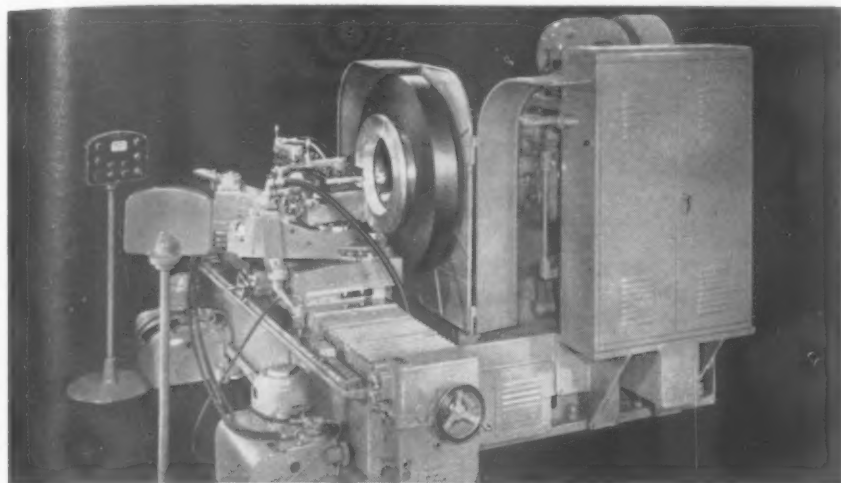
Mr. M. W. Saxman, president of the company, said the change was considered desirable since it more accurately described its present-day business and products. Mr. Saxman emphasized that the change in no way alters the operations or changes the corporate status of the firm.

JAMES COULTER FIRM STILL GOING STRONG

Following the recent auction sale of plant and equipment of the Coastal Machine Works, successor to the old Automatic Machine Co., there has been confusion in the impression of some people in industry that it was The James Coulter Machine Co. which was no longer in business. This was announced by Henry J. Emt, president of the James Coulter firm who added that there was no connection at all between his company and the auctioned organization.

Tools of Today . . .

Lathes for Machining Turbine Blades



Right Angle Lathe

The Monarch Machine Tool Company announces the development of two new 60-in. right angle lathes designed specifically for machining of jet engine rings, vanes, discs, wheels and other components.

Although designed expressly for machining jet engine components, both the lathes have a number of possible additional applications in other fields.

The air-gage tracer controlled tool slide is of the swiveling type, and is mounted on a swiveling power angular feed slide. The combination, because it imposes practically no limitation on the direction of tool approach to the work, provides a versatility which is essential for the economical machining of many complex jet aircraft parts. Power unit of the air-gage tracer is mounted on a track at the front of the bed. The continuous, single tool cut imparts a smooth, stepless finish. Automatic sizing is inherent in this method, reducing the chance for human error and practically eliminating spoilage of work. The combination of air-gaging and hydraulic slide control makes for a degree of accuracy not ordinarily associated with duplicating devices. Another advantage of tracer control is the ease and quickness of set-up change.

When a second air-gage tracer controlled tool slide is supplied, as with the model O machine, it is provided with its own power unit and pedestal type control type panel. Either the left-hand slide or the right-hand slide may be used for contour turning or contour boring. These operations may be performed singly but at one chucking of the work or, in many



cases, they may be performed simultaneously. To a large extent, this versatility is due to the use of the swiveling type air-gage tracer, but an important supplement to this is the provision for mounting the templet on either side of the carriage or on the bed.

Both model F and model O machines take either a 40-in. or a 52-in. face plate (with suitable splash guards). Work up to 60 in. in diameter may be swung in the gap as long as its thickness, or the combined thickness of the work and the holding fixture, does not exceed 14 in.

T-6-891

Turret Lathe

The LeBlond turbine wheel lathe, a new approach to the problem of profile facing cuts encountered in the production of jet aircraft engines, is now in production by the R. K. LeBlond Machine Tool Co., Cincinnati. The turbine wheel lathe design was conceived and executed for profile facing of compressor discs. A hand adjustment reading to 0.001 inches on a graduated dial sets up the depth of facing cuts. The carriage, a simple bridge across the abbreviated bed, carries a cross slide on which various types of tool slides may be mounted.

Initial variations in the basic design make this machine adaptable for facing the many different discs used in the various jet engines. Two headstocks are offered, the high-speed head for aluminum discs at the cold end of the engine, the other for stainless steel and titanium discs. The machines can be reversing or non-reversing and equipped with either manual or automatic controls.

On the automatic version, the LeBlond Hydra-Trace mounted on the cross slide has been made an integral part of the design. The Hydra-Trace is a simple, single-directional tracer in which a stylus follows the contours of a flat templet and hydraulically controls the path of the tool. The angle of the tracer slide is adjustable to meet the various conditions encountered in profile facing. Should pressure in the hydraulic system fall below 100 psi, a safety valve shuts off the entire machine.

The spindle speed is varied by means of a flat cam actuating a reactor which controls the variable speed unit in order to approach a constant cutting speed throughout the cycle. The cam may be conveniently modified or replaced to suit the required conditions.

T-6-892



NEW EASY WAY TO SELECT THE RIGHT PUMP FOR THE JOB

MODEL	SERVICE	OPERATING DATA CAPACITY	PACKING	PUMP MOUNTINGS	PUMP FEATURES
1000	Hydraulic	1000	Standard	Horizontal	Standard
1001	Hydraulic	1000	Standard	Horizontal	Standard
1002	Hydraulic	1000	Standard	Horizontal	Standard
1003	Hydraulic	1000	Standard	Horizontal	Standard
1004	Hydraulic	1000	Standard	Horizontal	Standard
1005	Hydraulic	1000	Standard	Horizontal	Standard
1006	Hydraulic	1000	Standard	Horizontal	Standard
1007	Hydraulic	1000	Standard	Horizontal	Standard
1008	Hydraulic	1000	Standard	Horizontal	Standard
1009	Hydraulic	1000	Standard	Horizontal	Standard
1010	Hydraulic	1000	Standard	Horizontal	Standard
1011	Hydraulic	1000	Standard	Horizontal	Standard
1012	Hydraulic	1000	Standard	Horizontal	Standard
1013	Hydraulic	1000	Standard	Horizontal	Standard
1014	Hydraulic	1000	Standard	Horizontal	Standard
1015	Hydraulic	1000	Standard	Horizontal	Standard
1016	Hydraulic	1000	Standard	Horizontal	Standard
1017	Hydraulic	1000	Standard	Horizontal	Standard
1018	Hydraulic	1000	Standard	Horizontal	Standard
1019	Hydraulic	1000	Standard	Horizontal	Standard
1020	Hydraulic	1000	Standard	Horizontal	Standard
1021	Hydraulic	1000	Standard	Horizontal	Standard
1022	Hydraulic	1000	Standard	Horizontal	Standard
1023	Hydraulic	1000	Standard	Horizontal	Standard
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1068	Hydraulic	1000	Standard	Horizontal	Standard
1069	Hydraulic	1000	Standard	Horizontal	Standard
1070	Hydraulic	1000	Standard	Horizontal	Standard
1071	Hydraulic	1000	Standard	Horizontal	Standard
1072	Hydraulic	1000	Standard	Horizontal	Standard
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1078	Hydraulic	1000	Standard	Horizontal	Standard
1079	Hydraulic	1000	Standard	Horizontal	Standard
1080	Hydraulic	1000	Standard	Horizontal	Standard
1081	Hydraulic	1000	Standard	Horizontal	Standard
1082	Hydraulic	1000	Standard	Horizontal	Standard
1083	Hydraulic	1000	Standard	Horizontal	Standard
1084	Hydraulic	1000	Standard	Horizontal	Standard
1085	Hydraulic	1000	Standard	Horizontal	Standard
1086	Hydraulic	1000	Standard	Horizontal	Standard
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1089	Hydraulic	1000	Standard	Horizontal	Standard
1090	Hydraulic	1000	Standard	Horizontal	Standard
1091	Hydraulic	1000	Standard	Horizontal	Standard
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1095	Hydraulic	1000	Standard	Horizontal	Standard
1096	Hydraulic	1000	Standard	Horizontal	Standard
1097	Hydraulic	1000	Standard	Horizontal	Standard
1098	Hydraulic	1000	Standard	Horizontal	Standard
1099	Hydraulic	1000	Standard	Horizontal	Standard
1100	Hydraulic	1000	Standard	Horizontal	Standard

**This
TUTHILL PUMP
GUIDE Helps You
Find the Answer**

To save you time and trouble in selecting the pump best-suited to your application, Tuthill engineers have developed this revolutionary new Pump Guide. Here, in one easy-to-use chart, is a volume-full of information on the complete line of Tuthill Pumps.

**Tuthill Positive
Displacement Pumps
serve Industry in
Lubrication,
Hydraulic, Coolant,
Oil Burning,
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Transfer Service.**

At a glance, it shows you the services for which each model is built, together with performance characteristics, types of packing, mounting styles and distinctive features that enable you to fit the pump to your need, rather than the need to the pump.

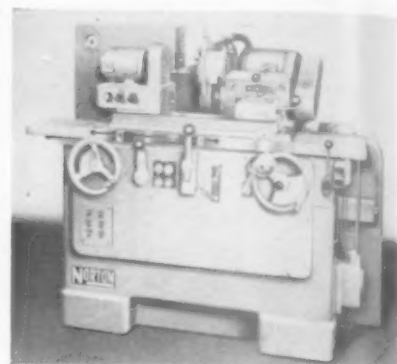
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-90

Cylindrical Grinder

For fast, accurate grinding of small cylindrical parts, Norton Co. has developed a cylindrical grinder, the 4-in. type CTU. This machine is available as a plain machine or as a semi-automatic in work length capacities of either 12 or 18 in.



In addition to its rapid, precise grinding action, the 4-in. type CTU provides operating ease. Wheel feeds and job setup are simplified by a graduated, wheel-feed handwheel. The graduations indicate the amount of feed as the handwheel is rotated past a fixed pointer. An indexing mechanism on the handwheel provides the advantage of making fine feed settings by feel rather than by setting an index pin in a target. This mechanism clicks a detent on rotation of its control knob, each click representing the setting for 0.0001 in. work diameter reduction.

T-6-901

Coating Machine

The 32-B Rollacoat finisher coats material up to 48 in. in width and 3 in. in thickness at speeds of 30 to 90 ft of linear travel per min.

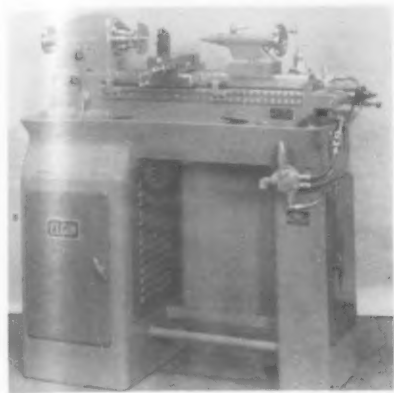
Six accessory kits make it possible to use this basic Rollacoat unit in practically any type of production coating line where flat material is finished and controlled thickness of coating is necessary.

The kits for the unit include a standard feed table with adjustable edge guide; a feed conveyor kit that can be added to the feed table making it into a short belt feed unit; a delivery table conveyor kit that can be mounted on the rear of the machine to carry small finished pieces far enough away from the machine to permit them to drop onto a drying conveyor; a pair of driven feed rolls that can be mounted on the front of the machine in place of the feed table; an extra long feed table with multiple drive rolls that can be added for handling long and heavy sheets; a brushing unit with dust-removing fan that can be added to the long feed table.

Made by the Gasway Corp., 6465 N. Ravenswood Ave., Chicago 26. **T-6-902**

Air Feed Production Lathe

A precision lathe, specifically designed for rapidly turning out parts in production is announced by the Elgin Tool Works, 1770 Berneau Ave., Chicago.

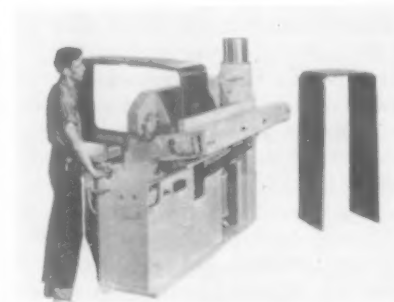


Pneumatic longitudinal feed eliminates gears, lead screw, worms and splitnut, which are the wearing parts causing most of the repairs in production lathes having the conventional type of longitudinal feed systems. Not only are there fewer wearing parts requiring replacement, but the speed of operation is stepped up to high degree.

The longitudinal feed of 12 in. is actuated by an air cylinder. Speed of feed is hydraulically controlled. A heavy stop is provided for exact control of any length. The lathe can be furnished with pneumatic or hand collet closer. It has a spindle speed of 120 to 3900 rpm. **T-6-911**

Tangent Bender

The model F single-wing tangent bender has been engineered to shape flanged sheets around fixed-radius corners without wrinkling. It facilitates rapid, accurate forming of metal cabinets, cases, housings, liners and shrouds



having two- or four-radius corners. Continuous high-speed production is assured by the open throat design which permits fully formed shapes to be removed from the machine easily and quickly. The ram latches with the bed the last inch of travel and exerts up to 17 tons vertical pressure.

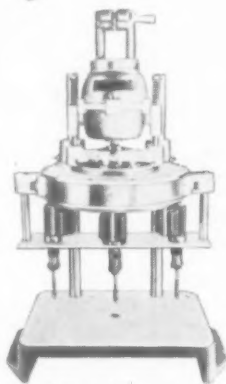
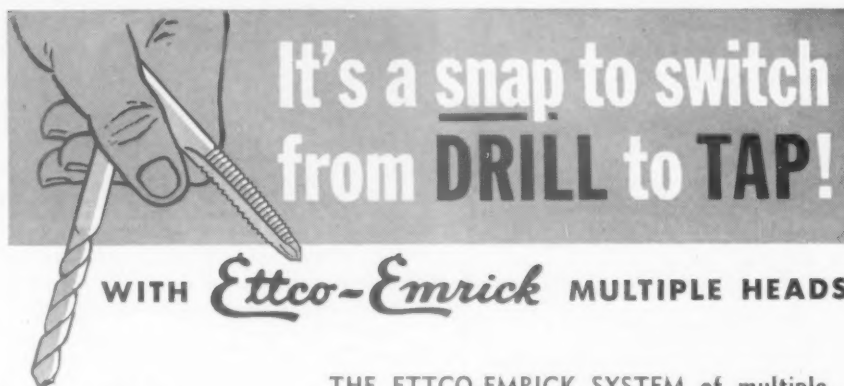
The Bath tangent bender features automatic positioning of the metal to be

formed and close control throughout the entire process. This results in volume production of uniform shapes without work wrinkles or deformation. Hand finishing is virtually eliminated.

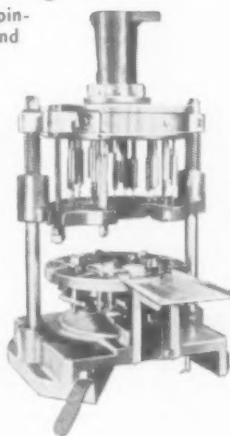
In operation, the metal to be formed is positioned on the bed of the machine which contains the female die. The overhead arm or ram, holding the male die, moves down upon the material and clamps it into position. The wing swings out and upward to effect positive shaping. At the same time it forms the desired shape, this tangent bender can accomplish any slitting, piercing, stamp-

ing or cutting operation within its 17-ton capacity. It can be varied to accommodate radius corners from $\frac{5}{8}$ to 5 inches by merely changing the rack and gear mechanism and the male die. All common styles of flanges as well as standard cabinet sizes can be handled by a single machine. For further information, write to Cyril Bath Co., 6999 Machinery Ave., Cleveland 3. **T-6-912**

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ON PAGE 101
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TOOLS OF TODAY INFORMATION



Adjustable spindle heads and fixtures.



Fixed spindle heads and fixtures.

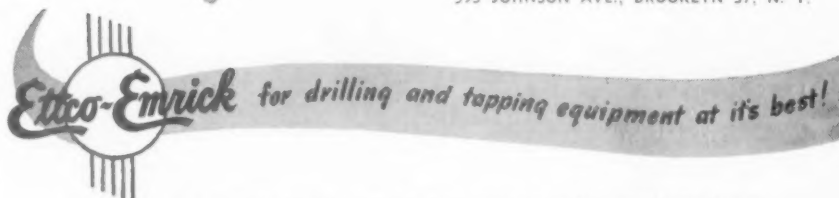
THE ETTCO-EMRICK SYSTEM of multiple spindle heads cuts drilling and tapping time to a minimum. And one of its big features is the ease with which it can be converted to either drilling or tapping. The changeover takes only a few minutes—and needs no special tools or skill.

This interchangeability, plus the fact that ETTCO-EMRICK head-and-fixture units are made of standardized parts—can be used on any drill press—and will turn out fast, accurate work with unskilled help—make the ETTCO-EMRICK SYSTEM the low-cost way to drill or tap small parts.

Ask your ETTCO-EMRICK distributor or write us for Bulletins No. 3 and 35 for full information.

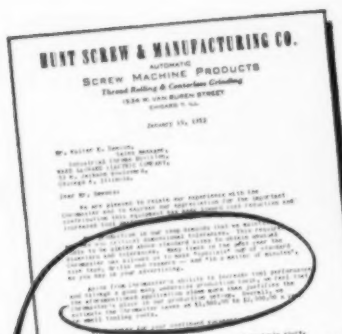
ETTCO TOOL CO., INC.

593 JOHNSON AVE., BROOKLYN 37, N. Y.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-91

**"Saves \$1,500
to \$2,000
in small
tool costs"**



Here's how one manufacturer cuts costs and increases tool performance by using a Chromaster industrial chrome plating unit right in his own plant.

"The production in our shop demands that we maintain extreme and critical dimensional tolerances. This requires tools to be plated above standard sizes to obtain unusual diameters and tolerances. Many times in the past year the Chromaster has allowed us to make 'specials' out of standard size taps, drills and reamers—and 'in a matter of minutes'. Over-all, we estimate the Chromaster saves us \$1,500.00 to \$2,000.00 a year in small tooling costs."

writes E. G. Dowell, General Manager,
Hunt Screw & Manufacturing Co., Chicago, Ill.

Other users are increasing their production and profits with this simple, fast, low-cost industrial chrome plating process.

A Large Automotive Axle Company Reports:

"Using a Chromasol plated tap with 3½ minutes plating, we are now averaging 6,800 holes per set of taps for banjo housings. This has more than doubled our former 3,000 holes per set of 7/16-14 high-speed commercial ground taps."

An Electric Motor Manufacturer Says:

"We have been able to correct manufacturing errors by Chromasol plating to salvage one hundred electric motor shafts otherwise rejected as undersize."

A Manufacturer of Plumbing Fixtures Says:

"Chromasol plating has increased the life of our 8-32 machine screw tap, used in tapping a plumbing fixture, from 1,000 pieces to 6,000 pieces."

A Pump Manufacturer Says:

"Our deliveries of small pumps for the oil

industry have been speeded as much as five days by depositing .0002" to .0005" Chromasol plate on shafts that would otherwise have been scrapped or sent out to a commercial chrome plating company. This operation in one instance permitted a \$16,000 pump unit to be put into operation immediately."

There's reason after reason for installing Chromaster in your plant. It can mean dollar savings to you in increased production, minimized set-up and down-time on your machine tool operation. Normal life of your cutting tools and wear parts can be multiplied three to ten times by this amazing new and simplified method of chrome plating. 3½ minutes for the average job. There's a size Chromaster for every shop.

Chromaster

Industrial Chrome Division
Ward Leonard Electric Co.
15 South Street,
Mount Vernon, N. Y.

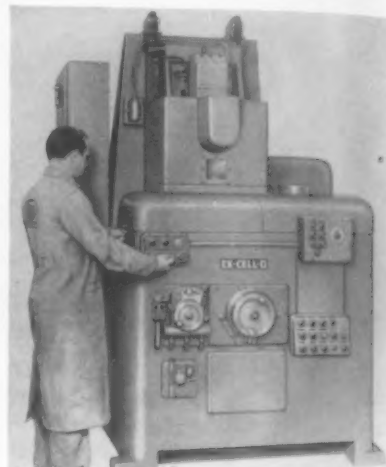
Please send information on industrial chrome plating with Chromaster.

NAME.....
COMPANY.....
ADDRESS.....
CITY.....ZONE.....STATE.....

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-92

Grinding Machine

Style 84 precision surface form grinder has been added to Ex-Cell-O's line of standard blade finishing machines. This model grinds flat, grooved or curved surfaces on the roots of jet engine compressor blades and turbine buckets. The machining cycle is fully automatic.



The machine base is heavy and rigid to insure accurate work and a good finish. A reciprocating worktable is hydraulically operated and electrically controlled. It accommodates removable work fixtures designed to suit the individual blades or buckets, and the work may be left in these fixtures for subsequent operations.

A motor-driven, cam-type diamond dresser shapes the grinding wheel for the desired form. It is mounted above the wheel spindle where it is readily accessible for changing or adjusting diamonds or cams. Dressing is part of the automatic machine cycle, but the dresser also may be controlled manually for setting up a new wheel or adjusting the cam. Ex-Cell-O Corp., Detroit 32.

T-6-921

Flexible Shaft Unit Drives

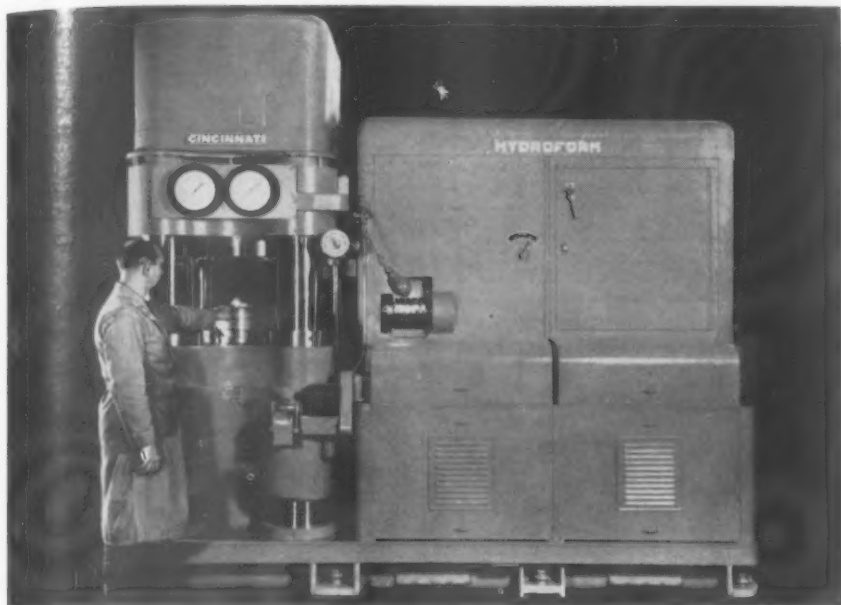
Elliott Manufacturing Co., Binghamton, N. Y., has announced a line of ready-to-use Econoflex flexible shaft unit drives, in four size ranges, heavy duty, medium duty, light duty and drill shaft unit.

The heavy duty range provides 180 different standard units, varying in style of end fittings, bearings, lengths of shafting, in core diameters from ½ to 1¼ in. The heavy duty drives are for applications requiring high strength, moderate flexibility, and lower operating speeds, as for power take-offs. They are specified by designers for connecting two rotary shafts which are not in line, or where one shaft moves relative to the other, or where frequent disconnection is required.

Write for Catalog No. 210 to Elliott Mfg. Co., 304 Prospect Ave., Binghamton, N. Y.

T-6-922

Forming Machines Use Flexible Die Member



A line of metal forming machines, operating on a unique principle, has been introduced by the Cincinnati Milling Machine Co. Known as Hydroform, the machines are marketed in 12-in. and 26-in. sizes, and can be made in sizes up to 40 in.

Hydroform machines operate on the principle of a solid punch member moving into a flexible, hydraulically pressurized die member, which is actually an oil cavity capped with a flexible diaphragm. Sheet metal between these two members is hydraulically formed to the shape of the punch. In operation, the flexible die member is lowered and locked, initial pressure is released, and then the punch member moves upward into the flexible die member. The blank is pressed tightly against the draw ring (surrounding the punch) to control metal flow. As the punch moves up, pressure is automatically increased on the blank being formed, and the metal is subjected to uniform pressure from all sides. Stripping is accomplished automatically as the punch is retracted.

Hydroform machines consist basically of the heavy base in which the bolster plate and punch are mounted, a dome which contains the flexible die member, and four strain rods for containing these units. The hydraulic system is equipped with a cooling unit to maintain the proper oil temperature. Electrical pushbuttons, manual control levers, and set-up elements are all grouped at the operator's working position. An automatic cycle control unit is arranged with adjustable dogs or master cam plates to control the complete cycle, including increased pressure in the dome, if desirable, while the

piece is forming. Maximum pump pressure developed by the hydraulic system is 8000 psi, although up to 15000 psi may be generated in the flexible die member as the punch moves up.

For information, write the Cincinnati Milling Machine Co., Cincinnati 9, for publication No. M-1759. **T-6-931**

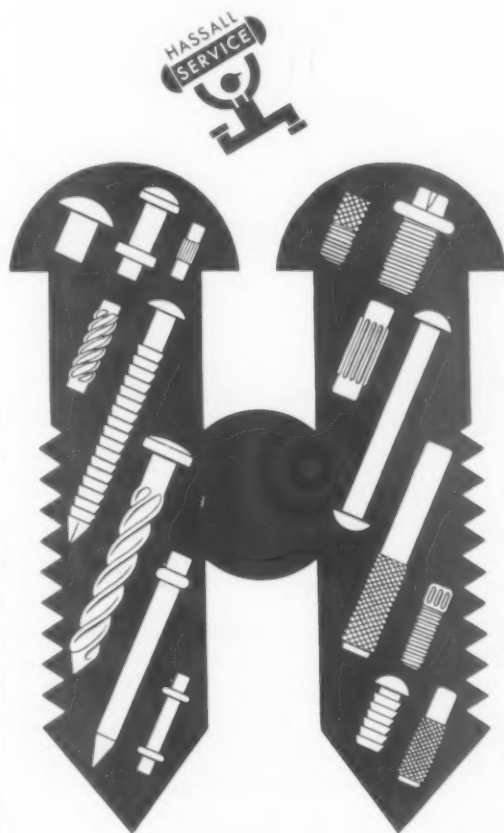
Control Station

Square D Co. has introduced an oil-tight control station in six-, nine-, twelve-, and sixteen-unit sizes, featuring a hinged cover to facilitate wiring and maintenance of the individual oil-tight control units. The line supplements the one-, two-, three- and four-unit enclosures already available.

Designed specifically for machine tool service, the cast enclosure is provided with a composition gasket between the box and cover to insure an oil-tight seal. Both the box and the individual units mounted within are constructed so that cutting oils, coolants, moisture and dust found in machine tool applications can not enter from the front of the enclosure, through the control units or through the enclosure mounting holes.

A complete line of individual oil-tight control units including push buttons, selector switches, selector push buttons, pilot lights, attachments and accessories is available, for mounting in these enclosures. Individual units and the enclosures are available separately for assembly by the customer as desired, or they may be purchased completely assembled to the customer's specifications.

Write for bulletin 9001 Type T, Square D Co., 4041 North Richards St., Milwaukee 12. **T-6-932**



Special cold headed products

... nails • rivets • screws
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... and to your specifications in any metal. Large raw material inventory for your convenience. Send drawing — advise quantity.

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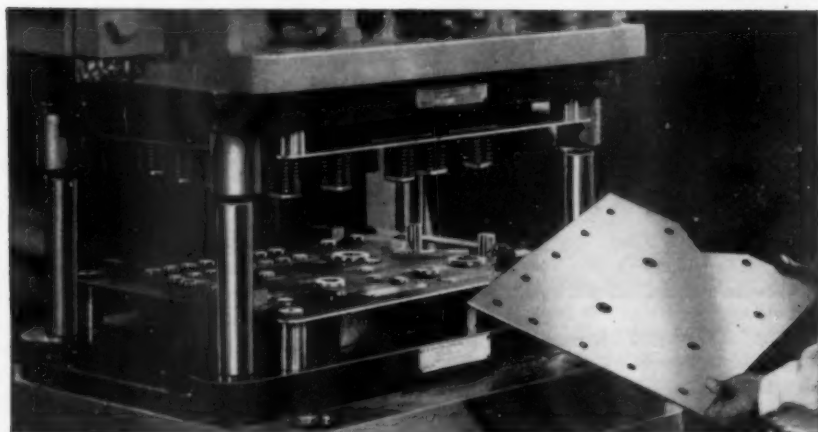
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LOW COST

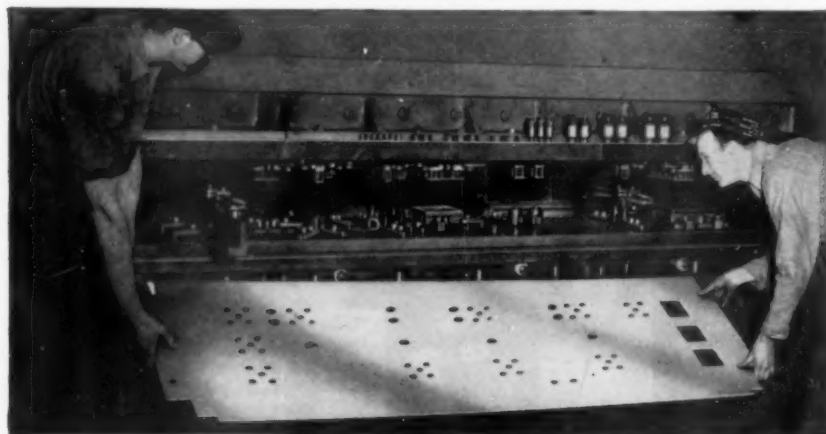
**methods for
PERFORATING
and NOTCHING
SHEET METALS**

Both methods feature: LOW DIE COSTS

All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION**—Down time is minutes as compared to hours for change-over. For precision work in all types and sizes of presses. **START PRODUCTION at once.** Pierce up to 1/4" thick mild steel. Saving money in the best known plants.



Whistler MAGNETIC Dies at work in large inclinable press. Magnetized units hold the retainers. No bolting required. A fast, economical method in making up a punch and die set for short or long runs. All parts re-usable.



Whistler ADJUSTABLE Dies on 1/8" steel perforating and notching job, using Tee slotted die set. With Whistler Adjustable Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.



Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

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Adjustable, Magnetic, Custom and Cam Dies for all Industry

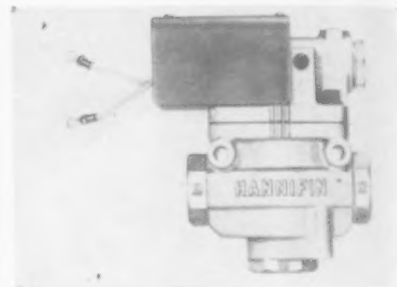
744 MILITARY ROAD, BUFFALO 23, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-94

Air Control Valve

Introduced by Hannifin Corporation, 1120 South Kilbourn Avenue, Chicago 24, the new P-M Pilot-Master valve for the directional control of air pressure, features both versatility and the simplicity which make for reduced maintenance.

The main or master valve portion can be operated either two-way or three-way, normally open to pressure or normally closed to pressure, without any internal change.



The main valve is pressure operated, through a piston-operated poppet. Since pressure acts both to actuate the poppet and to return it to its normal position, the main valve is completely springless, which eliminates a common source of valve failure. Maintenance is further simplified because the piston-poppet assembly, only moving part of the main valve, fits in a removable cartridge which acts both as the cylinder for the piston and as the upper seat for the poppet. This cartridge can be removed and replaced by removing the cover (in this case, the pilot head), without disturbing any of the main piping connections. Only two sizes of cartridge-and-piston-poppet assemblies are needed to service all five main valve bodies from 3/8 in. through 1 1/4 in. ips.

Similarly, one size of pilot head fits all five sizes of master valve in this Pilot-Master combination. Within the pilot head is a 3-way pilot valve, solenoid operated, which controls the main valve by introducing pressure into, or exhausting it from, the chamber above the piston. Pressure within the pilot valve is normally taken from the pressure side of the master valve and exhausted to the exhaust side of the master valve. However, pilot pressure from another source can be used.

Full 1/8-in. ips passages within the pilot valve, plus the fact that both the pilot stem and the main piston-poppet travel very short strokes, result in almost instantaneous valve action. On 60-cycle current this valve will shift in less than 1/20 of a second. T-6-941

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

A simple and practical method of blanketing metals with hydrogen, nitrogen, carburizing or other atmospheres while they are being heat-treated in the smaller shop type furnace has been developed by A. D. Alpine, Inc., 11837 Teale Street, Culver City, Calif.



Marking Machine

A combination of a complete air-feed and ejector assembly with a motor-driven marking machine as a complete unit is announced by The Acromark Co., 607 Morrell St., Elizabeth, N. J. This machine is intended for the marking of cylindrical parts such as shells, cartridges, drills, pins, shafts, tubular parts, etc.

The parts can be brought to the machine by conveyor or by other means and rolled into feeding position down a gravity chute. At each stroke of the machine, an automatic air valve releases a plunger that pushes the part into exact marking position. Immediately succeeding the marking, another part is pushed to position, automatically ejecting the one that has just been marked.

This automatic operation increases production substantially, insures perfect marking and permits the placing of this marking machine on a continuous production line where a conveyor can carry the marked parts away and the only attention on the part of the operator needed is guidance of the parts as they go into the gravity chute-feed. This also can be made automatic for a continuous operation with little or no attention.

This machine itself, designated model 9AMA, is approximately 36 in. left to right x 24 in. deep x 16 in. high. The motor drive is a gear-reduction motor

furnished for 110 to 220 volt, 60-cycle ac and the air pressure can be taken from a standard, medium to high pressure, line. The machine uses an interchangeable die holder in which can be inserted steel marking type or dies with any desired lettering, numbering or design. The type for dies is of straight line style. The part is rotated in a set of ball-bearing cradle rolls and the die passes over the part to impress the mark.

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and TOOLS

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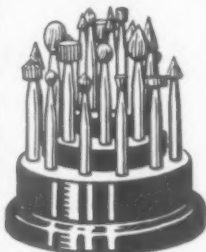


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at any price.



**HAND CUT
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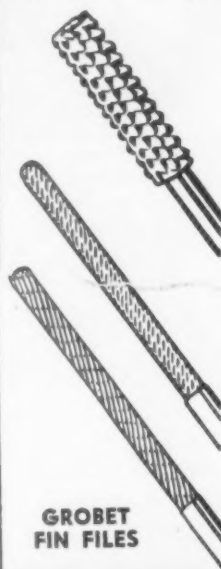
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Write today for Catalog No. 108 which shows all other standard grades of Newcomer Carbides.

S-6 Carbide is new and different—industry-proven on machining Armor plate, rough steel forgings and castings. Even though S-6 Carbide can be used at high machining speeds, its greatest tool life is obtained at speeds slower than those at which other grades of carbide can be successfully used. S-6 Carbide removes stock fast because of the heavy feeds permissible. S-6 Carbide because of its extremely high strength, is excellent for interrupted cuts.

NEWCOMER PRODUCTS, INC.

General Sales Offices

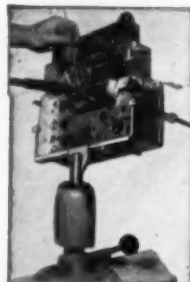
PITTSBURGH 21, PENNA.

Plants at LATROBE, PENNA.

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POWRARM cuts costs by increasing every worker's productivity. It gives the worker a powerful *third hand* to hold work while two hands produce. That's why POWRARM works on the most efficient assembly lines in America today, and *belongs on yours*. Write us about your production "head-ache" . . . we'll show you how POWRARM can cure it.

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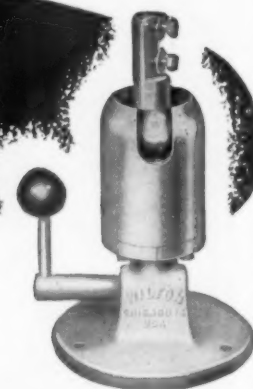
WILTON TOOL MFG. CO.

Precision Built Bench Vises, "C" Clamps and Work Positioners

925-H Wrightwood Ave.

Chicago 14, Illinois

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Holds work at any angle in Horizontal, Vertical or Co-axial Plane.

Three sizes of Powrarm—24 to 150 lbs. capacity.



Belt Conveyor

A low-cost cleated belt conveyor for handling light stampings, screw machine products, scrap, and similar press-room and machine-shop material is now being manufactured by the Rapids-Standard Company, Inc., Dept. LPV, 342 Rapistan Bldg. Grand Rapids 2, Mich. Called the Press-Veyor, Jr., this compact portable power unit speeds up plant operations by maintaining a smooth flow of goods from production machines to tote boxes.



The conveyor is available in 4, 6, and 8-foot lengths and 4, 8, and 12-inch belt widths for handling a wide range of products. The rigid 12-gage steel bed and guard rails are formed in one piece to prevent parts handled from catching and being damaged.

The Press-Veyor, Jr. can be had with woven cotton, Neoprene, or water-proofed woven cotton belts with steel cleats spaced on 24-inch centers. The standard belt speed is 55 feet per minute—higher and lower speeds are available. A choice of single or three-phase motors for 115 or 220/440 volts is offered.

T-6-961

Button-Head Screw

A button-head, socket screw, designed for use where streamlined appearance and high strength are wanted, has been put on the market.

The screw has a low head with a hexagon socket. Made of alloy steel and heat-treated, it can be used without loss of strength in place of screws with higher heads, many of which have sharp, dangerous corners. Hence the low button-head promotes safety and ease of cleaning.

The button-head screw is made in seven thread diameters. No. 8 (0.164 in.); No. 10 (0.190 in.); 1/4, 5/16, 3/8, 1/2 and 5/8 in. All except the 1/2 and 5/8 in., which are produced in the National Coarse series only, are available in both National Coarse and National Fine threads. The different diameters, all threaded to the head, come in four to seven lengths. Threads are precision rolled.

For additional information, address Standard Pressed Steel Co., Box 786, Jenkintown, Pa.

T-6-962

Small Dust Collector

A self-contained Dustkop dust collector designed for remotely located individual dust sources such as grinders, polishers, sanders, buffers, etc. is made by the Aget-Detroit Co., 125 Main St., Ann Arbor, Mich.



The unit, the model 520 Dustkop, while requiring only an 18 x 23-in. floor space and a 25-in. overall height, develops a rated 525 cfm at a static suction of a 2-in. water lift. This performance rating permits it to be used under most state codes for the collection of dust, lint, dirt, chips and to recirculate the cleaned air within the working space for a consequent saving of heat.

Model 520, available with single or double inlet connections, has a paddle wheel, self-clearing type fan direct-driven by a 1/3-hp continuous duty motor, the latter for operation on either 110-volt, one-phase, or 220-volt or 440-volt, three-phase, 60-cycle power. A built-in cyclone separator of predetermined size and performance characteristics removes all dusts down to 20 micron size and precipitates them into the dust storage compartment which comprises the base of the unit.

T-6-971

Double-Throw Switch

A snap-action switch designed for high-precision performance in rugged, cam-actuated service has just been announced by Micro Switch, a division of Minneapolis-Honeywell Regulator Co.

This design has a roller plunger actuator adapted to operation by cams with a rise of up to 30 degrees. The plunger assembly can be turned to any position necessary to align its roller with the direction of cam approach. A nut is then tightened down, clamping the plunger assembly securely in position.

Underwriters' Laboratories list these switches as follows: 3/4 hp, 115 volts ac; 1 1/2 hp, 230 volts ac; 20 amperes, 125, 250, or 460 volts ac; 10 amperes, 125 volts ac "L"; 1/2 ampere, 125 volts dc; 1/4 ampere, 250 volts dc. ("L" rating denotes suitability for controlling tungsten filament lamp load on alternating current).

T-6-972

Production Drills

A line of portable 1/4-in. capacity electric drills offers a choice of free drilling speeds of 600, 800, 1000, 1750, 2500, 3500 or 5000 rpm. Three styles are available—pistol grip, spade handle and center contour handle design.

Ample operating freedom is gained through compact size and a weight of 3 1/2 to 4 pounds. This lightweight aluminum construction is coupled with balanced armatures and precision-matched gears to reduce tiring vibrations. All three models feature universal type ac-dc motors and can be had for either 115- or 230-volt, 25- to 60-cycle current.

For details write Mall Tool Co., 7725 So. Chicago Ave., Chicago 19.

T-6-973

Copying Lathe

The New Britain +GF+ copying lathe is a new approach to contour turning and internal copying. In plants which can use such a machine tool even fifty percent of the time, it is probable that substantial economies can be effected in this type of turning.

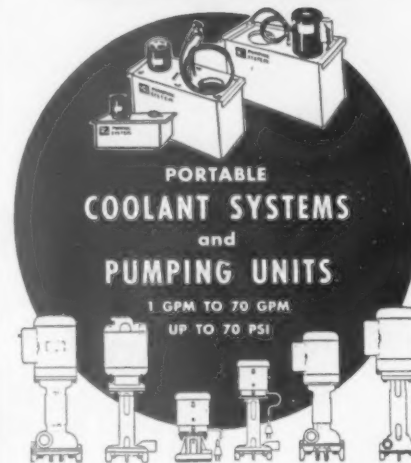


Some of the features which contribute to these savings are: There is no conventional flat bed to interfere with the flow of chips to the chip pan beneath the machine. Chips are removed through the rear of the machine without interrupting production. Location of the templet on the front of the machine facilitates changeover or adjustment, and places the templet in full view.

The entire hydraulic system, which features a design of the utmost simplicity, is enclosed in the carriage. Contact pressure of the tracer against the templet is very light, permitting the use of templets cut out of thin unhardened steel. Copying range is increased through use of a duplex tool holder, and the copying tool is supported on the hold length of the shank by a tool holder of great stability. These and other features result in unusually good surface finish, combined with dimensional accuracy. New Britain Machine Co., New Britain, Conn. **T-6-974**

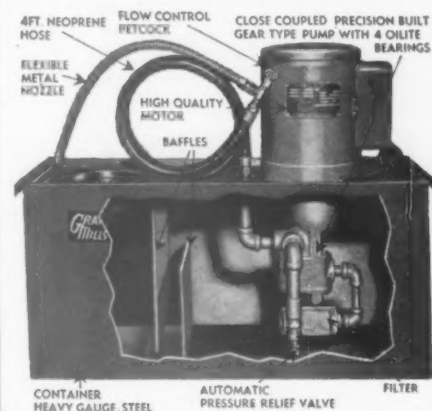
USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Get More Production from your Machines with



PROPER application of coolants mean increased production and time and tool savings. You can have these advantages for every machine—small, large, and special—with Graymills Portable Coolant Systems.

They can be installed in a few minutes, are modern in design, and of heavy duty construction with built-in automatic pressure relief valve on gear pumps.



Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to 1/2 HP ratings, 1 gal. to 70 g.p.m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.

MOST INDUSTRIAL DISTRIBUTORS STOCK STANDARD UNITS.

WRITE FOR NEW CATALOG SHOWING SELECTION CHART . . . TELLS THE RIGHT PUMP OR COOLANT SYSTEM FOR THE JOB.



GRAYMILLS CORPORATION
3729 LINCOLN AVENUE • CHICAGO 13

INDICATE A-6-97

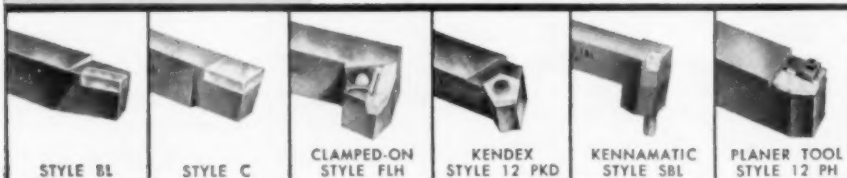


**FIGURING
TOOL
COSTS
ON
PERFORMANCE
... NOT PRICE,
PAYS BIG
DIVIDENDS**



KENNAMETAL Inc., Latrobe, Pa.

**MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES
AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY**



Productivity—not pennies—is the only way to judge the cost of a tool. No tool deserves a place in your shop unless it can prove . . . on the job . . . that it will enable the machine to operate at peak performance, with minimum downtime.

Kennametal cemented carbide tools are made by processes that are exclusive and expensive, but which are worth far more than the cost . . . because they assure a tool material of consistent soundness.

This Kennametal characteristic pays off—in your shop. In many instances, Kennametal tools will pay for themselves in savings effected in grinding, alone. And this does not take into account reduced tooling costs, and improved production rates attained.

We'll send you, on request, reports that show cost reductions of thousands of dollars on many different operations through the use of Kennametal tooling. But—there is a much better way to demonstrate. That's in your shop, on your job. Ask us to do it.

Casting Furnace

Developed for high-speed production of precision castings, this mechanically operated Ajax-Northrup induction furnace transfers molten metal from furnace to mold in any preset cycle, usually only a few seconds. Typical of high-performance parts being cast with the new units are jet engine vanes and blades, compressor parts and small ordnance components.



Operation is simple. At the end of the melting period, the pre-heated mold or investment is clamped directly to the top of the crucible with a specially-fitted mold-holder. Operation of a control lever causes the furnace to rotate to pouring position.

Temperature and analysis can be controlled within extremely close limits. The electro-magnetic stirring action common to induction furnaces assures even distribution of elements throughout the melt. Since there are no carbon electrodes, there is no chance for carbon contamination. **T-6-981**

Aircraft Wire

A new aircraft wire developed to meet electronic wiring applications for military aircraft features a polyvinyl chloride plastic primary insulation and a nylon jacket extruded on the wire. A product of Surprenant, Boston, Mass., the wire meets all requirements of MIL-W-5274A.

The polyvinyl chloride plastic primary covering, made from B. F. Goodrich Chemical Company's Geon resin, helps to provide the wire with resistance to cold weather (—54 deg plus or minus 1 deg C without cracking), oil, grease, fungus, abrasion, and flame. Vinyl is self-extinguishing when the source of flame is removed. The nylon jacket provides additional protection against these hazards. **T-6-982**

Spring Tester

This Carlson-Chatillon spring tester (patent pending) is an accurate precision instrument for checking the loads and deflections of compression and extension springs and was designed to fill a need among product manufacturers for an accurate low-cost tester. It is used for both general purpose testing and for high quantity production testing. Speed of production testing varies from 300 to 600 tests per hour. Production stops and tolerance markers are easily adjustable and accuracy is guaranteed within 0.25 percent, thereby meeting the requirements of the National Bureau of Standards. A dial indicator for reading deflections with extreme accuracy is available. Steel rules 12 in. long measure lengths in 32nds and 64ths on one side and in decimals in 10ths and 100ths on the reverse side. Loads up to 300 lb, spring diameters up to 4 in., spring lengths up to 12 in. for compression and 10 in. for extension can be accommodated.

Made by The Carlson Co., 277 Broadway, New York 7. **T-6-991**

Hand-Screw Machine

A ten-in. hand-screw machine for both low-speed production work and high precision secondary operations is announced by Globe Heat-Seal, Inc., 3380 So. Robertson Blvd., Los Angeles 34, California.



The machine offers the features of ruggedness with a range of slow spindle speeds for heavy roughing operations and high accuracy with fast spindle speeds for small diameter, close tolerance work. Speed range is from 184 to 3796 rpm in 16 different spindle speeds. A four-position quick change gear-box makes instant speed selection possible. A one-hp. two-speed, instant-reversing motor powers the spindle.

The large spindle, equipped with a No. 5 Morse taper, has a 1-7/16-in. inside diameter and accommodates work capacities of one in. with bar type collet closers and 1 3/8 in. using nose type collet closers. **T-6-992**

Production News

ABOUT *Lusol*—THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY • PORTLAND, CONNECTICUT

LUSOL OUTCOOLS, OUTPRODUCES ALL OTHER COOLANTS

You can get far greater production from your shop, and you can do it without adding a single machine or tool or man, simply by switching to Lusol. You can prove these facts about Lusol to your own satisfaction in your own plant—just as thousands of others have already done.

Lusol is a clear, all-chemical concentrate that is diluted with water and used in the coolant system of almost every type of machine tool—lathes, grinders, milling machines, saws, broaches, even rolls and presses. In each of these operations we have cases of increases in tool life as high as 500% and even higher. Less down time for tool dressing means greater production. Work stays cooler because Lusol is a super-coolant. Oilless Lusol reduces the surface tension of water so it penetrates to the very cutting edges of the tools, keeps grinding wheels from loading up.

Workers like Lusol! A mild combination of chemicals, milder than most toilet soaps, Lusol by itself can't become foul smelling or cause dermatitis. Workers' hands, clothes and the surrounding floors stay clean and non-oily. Frequently, parts made with Lusol need not be degreased before painting, plating or assembly. While not a rust preventive, Lusol reduces the possibility of rust on parts that are stored between stages of production.

users say*

case histories of Lusol at work

A CONVEYOR MANUFACTURER—"8,000 forged steel brackets produced per broach grind with Lusol in the machine, compared to the previous 3,500 pieces. Doubled production and less down time for changing broaches for resharping."

A FARM EQUIPMENT MAKER—"Have had outstanding success on deep drilling in balancing crankshafts. Drill 3/16" holes and, where we could only go 2 1/2" deep, we now go as deep as 3 1/2" with Lusol."

A SUBCONTRACTOR—"No greasiness on the finished parts, so we bundle them for shipment just as they come off the machines. Some have to be given a prime coat of paint; we simply wipe them off with a cloth and then spray them."

A CRANKSHAFT MANUFACTURER—"We wash \$5 worth of grinding wheel down the sewer every time we dress a wheel. Since we adopted Lusol for our entire grinding department, we've saved an awful lot of money by reducing the number of dressings our wheels require."

(*Users' names furnished on request.)



FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 213A, Portland, Conn.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-99

Here's how the Grinding Department figures it...



That 'formula' sure paid off in one grinding department. What does it mean? Simply this: a Simonds Abrasive Company grinding wheel—specification C16-S7-B1—boosted production 25%. Why? Because this wheel is accurately specified for the job it had to do. This is true of all Simonds wheel specifications. They're listed in our free data book, along with details on our complete line of grinding wheels, mounted wheels and points, segments and abrasive grain—plus information on how you can get Simonds wheels specially made for out-of-the ordinary jobs. Write for it. Also name of your nearby distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-100

Hydraulic Turret Drive

A hydraulic drive for powering ram-type hand turret lathes is announced by Viking Industries, Rockford, Ill.

This attachment is designed for turret lathes with six-station turrets and is adaptable to lathes with bar stock capacity up to 2½ in. It can be attached to any standard make ram-type turret. It is simple and efficient operating and provides a continuous or an interrupted cycle to speed short or long run work.



The complete unit consists of a ¾-hp motor, two pumps, reservoir, fluid motor, control valves, and connections.

Automatic individual cycles and feed rates can be quickly and easily set to suit different operations in six or fewer number of turret positions. Individual circuit control rods and adjustable dogs provide the means for controlling the rate and length of feed. Individual cycles for each of the six positions can be set for rapid approach, dwell, infinite adjustable feed, and quick return.

Once set up, the operator simply starts the cycle with a hand lever. Stop is automatic after any series of operations. While the turret drive is in automatic operation, the operator is free to inspect and prepare the next piece for chucking. T-6-1001

Drill Press

A new development in drive-belt alignment devices is one of several features of the 1650 Series drill presses being marketed by Boice-Crane Co., 934 Central Ave., Toledo. These presses offer a two-way drive aligner-belt tensioner. Perfect drive-belt alignment is assured at all times and, without wrenches or tools, belt tension is instantly released for quick, easy speed changing.

These drill presses have involute design 6-tooth splined drive, and every splined-drive part, including the pulley drive sleeve, is made of steel for quiet running and longer life. A guard covers the pulley spindle which is guaranteed true running by four heavy grease-sealed ball bearings.

Other features include a massive head and positive, easy operating, quick-acting non-marring quill and column locks.

A selection of speeds is available in two ranges, 500, 925, 1750, 3250 and 5500 rpm in the high and 425, 775, 1300, 2200 and 3340 rpm in the low.

T-6-1002

THE TOOL ENGINEER'S Service Bureau

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-6-112-1	Ace Drill Bushing Co., Inc.	1101-2	Catalog covers line of bushings stressing accuracy, quality and economy.
A-6-184	Adamas Carbide Corp.	A851	"Aid to Carbide Users" tells about advantages of Adamas solid carbide inserts.
A-6-162	American Broach & Machine Co.		Complete machine specifications in Blue & Gold catalog on broaches.
A-6-103-1	American Wheelabrator & Equipment Corp.	23	Bulletin shows Liquamette's simplified design has reduced precision finishing costs.
A-6-29	Ampee Metal, Inc.		Literature describes company's products and gives general application.
A-6-99	F. E. Anderson Oil Co.		Twenty-page booklet contains information on machine cleaning, maintenance and related subjects plus case histories of Lusol at work.
A-6-175	Behr-Manning Corp.		"Blueprints for Production" gives case histories showing new ways to cut costs with company's coated abrasives.
A-6-136	The Bellows Co.		"Foto Facts File" describes "controlled-air-power" drilling and tapping operations at Hotpoint installation.
A-6-123	Bealy-Welles Corp.		Literature outlines details of company's "job-fitted" wheel service.
A-6-141	Bethlehem Steel Co.	265	Booklet gives details on Bethlehem's hot-work steels.
A-6-146-1	The Bristol Co.		Bulletins show applications of Bristol's multiple-spline screws.
A-6-159-1	Chicago Rivet & Machine Co.		Catalog contains engineering information, descriptions, and specifications of automatic rivet setters.
A-6-144-1	Chicago Tool and Engineering Co.	10	Circular tells all about Palmgren rotary, index, milling table.
A-6-159-2	The Cleveland Tapping Machine Co.	T-16	Catalog explains special points and advantages of tapping machine line.
A-6-193	Colonial Broach Co.	DS-52	"Dymon-ize" bulletin deals with units for use on broach grinders stressing resultant performance advantages.
A-6-181	Crucible Steel Company of America		Tool Steel Selector aids in choosing proper steel for particular use.
A-6-145	Danly Machine Specialties, Inc.		Booklet "Save Tooling Time" tells how Danly's line helps save tooling time.
A-6-194-2	Die Techniques Publishers	77	Bulletin discusses information contained in handbook on dies.
A-D-6	The DoAll Co.		Twenty-four page "Modern Measurement Control" describes special features and uses of DoAll blocks and accessories.
A-6-152-1	The Eastern Machine Screw Corp.		Several publications present valuable information on various types insert chaser die heads and pertinent allied topics.
A-6-91	Ettco Tool Co., Inc.	3, 35	Two bulletins on the Ettco-Emrick system of multiple spindle heads.
A-6-125	A. B. Farquhar Co.		Catalog shows line of hydraulic presses in all sizes and capacities for all types of industry.
A-6-8	Gisholt Machine Co.		Increased production possibilities stressed in catalog dealing with Fastermatic.
A-6-158	Gisholt Machine Co.		"Wear and Surface Finish" booklet deals with solution to oil seal troubles.
A-6-97	Graymills Corp.		Catalog shows selection chart to assist in choosing right pump or coolant system for the job.
A-6-172	Haynes Stellite Co.		Manual "Haynes Stellite Metal-Cutting Tools."
A-6-87	The Hisey-Wolf Machine Co.	71 EP	More than 200 different types and sizes of bench and pedestal grinders, buffers and polishers and other equipment covered in catalog.
A-6-127	The B. Jahn Manufacturing Co.		"Story of B. Jahn Production Proved Dies" emphasizes performance and savings.
A-6-201	Jones & Lamson Machine Co.		Illustrated catalog gives complete information on radial and tangent chaser die heads and dies for B & S machines.
A-6-2	Landis Machine Co.	H-75	Bulletin presents complete information on Landmaco Machines pointing out various advantages in output and accuracy.

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THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER

COMPANY

BULLETIN

DESCRIPTION

A-6-16	The Lapointe Machine Tool Co.....	HP-5	Special bulletin covers horizontal broaching machines.
A-6-151	Logan Engineering Co.....		Lathe and shaper catalog explains construction, operation and advantages of Logan line.
A-6-111	Lovejoy Tool Co., Inc.....		High performance and economy stressed in catalog "Lovejoy Tools."
A-6-138	Master Manufacturing Co.....		Illustrated 24-page catalog covers Master machine tool attachments for lathes, turrets and mills.
A-6-142-5	Jas. H. Matthews & Co.....	B-6	Bulletin explains operation of nameplate marking machine and its advantages.
A-6-130-3	Metal Carbides Corp.....	50-G	Catalog tells how to secure more production from present machinery through use of Talide metal.
A-6-167	Miller Motor Co.....	A-105 H-104	Illustrated cylinder bulletins cover line of air and low and high-pressure hydraulic cylinders.
A-6-163	Modern Tool Works.....	M-103	Bulletin gives full information on both Modern-Magic and standard quick change chuck and collet equipment.
A-6-105-2	Morton Machine Works.....		"Morton Fixture Clamps and Details" covers complete line with full size templates of each product.
A-6-96-1	Newcomer Products, Inc.....	108	Catalog shows standard grades of Newcomer carbides.
A-6-4	Niagara Machine and Tool Works.....	87	Bulletin introduces Niagara's air power squaring shears for sheet metal shop work stressing economy.
A-6-179	Norton Co.....	Form 835	Cost-saving facts on toolroom grinding contained in 162-page booklet.
A-6-9	Norton Co.....	852-7	Bulletin on Thru-Feed Lapper stresses savings and other advantages.
A-6-191	Norton Co.....	1340	"Setting Up Polishing Wheels and Belts" contains helpful tips on this subject.
A-6-190-1	Oakite Products, Inc.....		Interesting facts about burnishing with Oakite Composition No. 3 and on methods for cleaning and bright-dipping and other pertinent information in illustrated bulletin.
A-6-107-1	O'Neill-Irwin Mfg. Co.....		"Die-Less Duplicating" catalog gives particulars of Di-Aero equipment.
A-6-122-2	Ortman-Miller Machine Co.....	38	Catalog contains diagrams, specifications and parts listings as well as other pertinent information on O-M air hydraulic water cylinders. Also complete set of templates showing all cylinders and mounting brackets.
A-6-129	Potter & Johnston Co.....		Bulletin on P & J precision production tooling points out productivity, precision and economy advantages of line.
A-6-21	Pope Machinery Corp.....		Information on Pope spindles and their effect on production.
A-6-180	Scully-Jones and Co.....	1-50	Bulletin on Scully-Jones drill and tap chucks supersedes all previously published listings and prices.
A-6-210	The Sheffield Corp.....		Information on "Crushtrue Roll Bank" and specifications on these devices.
A-6-121	The Sentry Co.....	WE-2	Catalog deals with advantages and operations of Wetmore reamers.
A-6-5	Standard Gage Co., Inc.....	B	Condensed catalog covers the many types of gages, stressing their main points and advantages.
A-6-32	Sun Industrial Products.....		"Cutting and Grinding Facts" talks about cutting oil, pointing out economy and efficiency.
A-6-178-1	Swarts Tool Products Co., Inc.....	941	Catalog on tool locks explains their use and advantages.
A-6-134	The Taft-Peirce Manufacturing Co.....	410	Magnetic chuck bulletin points out savings in time and money.
A-6-106	Vlier Manufacturing Co.....	53	Catalog includes information on spring plungers, spring stops, fixture keys and toggle pads.
A-6-92	Ward Leonard Electric Co.....		Brochure deals with industrial chrome plating with Chromaster.
A-6-194-1	Waukesha Tool Co.....		Quick-reference catalog gives complete specifications on standard line of cutting tools.
A-6-94	S. B. Whistler & Sons, Inc.....		Complete details including prices and application illustrations concerning magnetic and adjustable dies.
A-6-96-2	Wilton Tool Mfg. Co.....	101E	Thirty-two pages of cures for "production headaches."
A-6-187	The Yoder Co.....		Illustrated handbook on cold roll forming.

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LIQUAMATTE
and Your Future



what
SIMPLIFIED WET BLASTING
means to you

The cost of close tolerance finishing can vary almost as much as the weather. Through development of wet blasting, large savings have been made possible in finishing costs . . . and now Liquamatte makes wet blasting **EVEN MORE** practical, economical and convenient. The Liquamatte has 14 advanced design features that overcome the many



Typical heat treated forging die, one half of which has been cleaned with the Liquamatte using a fine mesh Liquablastic.

operating difficulties usually found in wet blasting. Thus it reduces finishing costs to the very minimum.

With the Liquamatte, "hand" finishes are produced mechanically in a matter of seconds, eliminating many tedious operations. Precision parts can be processed while holding tolerances of .0001". Scale and directional grinding lines are uniformly removed, greatly prolonging the life of expensive tools and dies.



SEND TODAY FOR BULLETIN 23. It shows how Liquamatte's simplified design has reduced precision finishing costs to a new low.

American
WHEELABRATOR & EQUIPMENT CORP.
856 S. Byrkit Street, Mishawaka, Indiana

INDICATE A-6-103-1

June, 1952

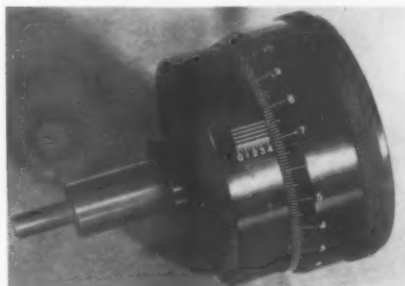
Measuring Device

Scan-A-Scale, a product offered by F. T. Griswold Mfg. Co., Wayne, Pa., provides a very precise and simple optical method of making linear measurements on machine tools. The device, which provides fast, accurate, dependable direct visual reading, consists of two microscopes and two satin chrome finished scales graduated in 50 thousandths of an inch. By rotating a dial on the microscope, the 50 thousandths graduation on the scale can be divided so that readings to four decimal places are easily determined. Uses include controlling table movement and boring head location on jig borers and boring mills; positioning lathe carriages longitudinally in order to secure accurate length settings; locating milling machine table in respect to the spindle in all of its three planes; positioning cylindrical grinding machine tables in relation to the side of the wheel.

T-6-1031

Micrometer Head

Reading directly in tenths and by vernier to 0.000025 in., this micrometer head has a spindle which does not rotate as it is advanced or retracted. Such a non-rotating spindle lends itself to special applications, and chisel or other special shaped anvils can be provided.



The lead-screw, ground from the solid, hardened and normalized stock, has an over-all accuracy of 0.000050 in. in pitch throughout its working range. Compensation is provided by the dial-mounted scale and vernier, which is individually set as each instrument is calibrated. This individual setting of each head is to an accuracy of 15 millionths.

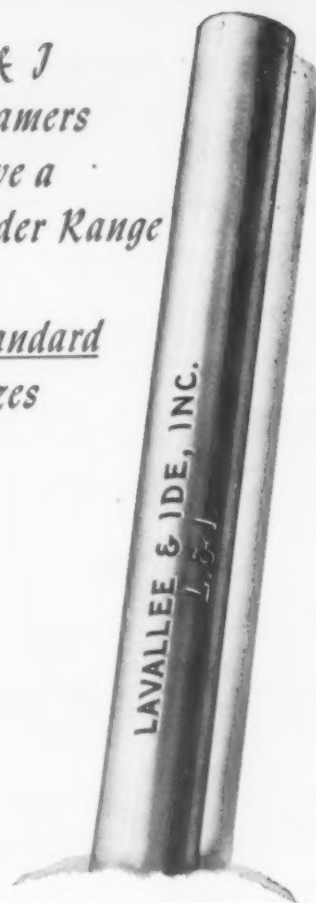
Internal wear is minimized by the use of tungsten carbide disc and ball contact. Adjustment is provided for lead screw tension, eliminating back-lash in either direction of rotation.

The aluminum barrel and thimble are finished in black anodize, with white lines and figures. The instrument measures 3 5/8 in. in diameter and is 5 in. long with spindle fully retracted.

For information write the Boeckeler Instrument Company, 39 E. Rillito St., Tucson, Arizona.

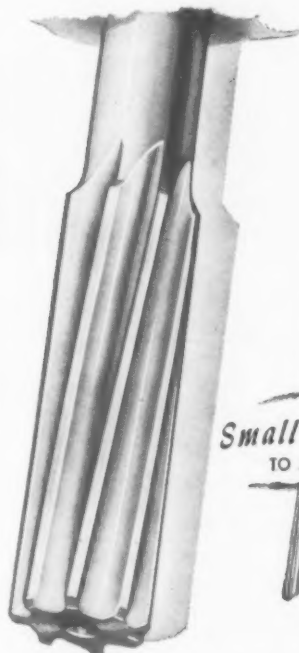
T-6-1032

*L & I
Reamers
have a
Wider Range
of
Standard
Sizes*



Large Sizes

TO 1 1/2"



Small Sizes
TO .040



The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

INDICATE A-6-103-2

103

Floating Anchor Nut

A Kaylock light-weight self-locking nut, now available in a floating anchor nut type, is made by the Kaynar Co., 820 E. 16th St., Los Angeles. The floating anchor nut design incorporates new principles of design.

It consists of an assembly of two parts—a threaded nut portion and a retaining shell, providing a 1/16-in. radial movement between the nut and the anchoring portion. Both parts are formed of light gage annealed spring steel, and are spring tempered to provide a light-weight, yet rigid and



strong, fastening device. The "float" (a lateral movement between the nut and the anchored retaining shell) facilitates alignment of the nut and the bolt in subsequent assembly.

A feature of this floating anchor nut

is that in its plan view it is identical in outline and size to standard fixed anchor nuts of comparable thread size, thus permitting complete interchangeability.

Kaylock floating anchor nuts are made in conformance with government specifications AN-N-10a and AN-N-5b. Of all spring steel construction, they possess a locking design wherein their upper threads are made elliptical and highly resilient, allowing all threads to carry the actual load, and eliminating the necessity of an auxiliary locking device. This provides a gentle locking action that does not cut the plating or the threads of the attaching bolt.

T-6-1041

Power Press

This press features an instant-action, electrically operated, nine-point jaw clutch which combines the simplicity of electric control and the high efficiency of jaw clutches. The electronic clutch is activated by a simple touch of the foot control, or optional hand controls.



A limit switch on the clutch housing provides absolute single-stroke control. The selector switch readies the press for either single-stroke non-repeat, or continuous action, without stopping the press. A neutral position locks the clutch in place regardless if foot or hand controls are activated. An electronic timer converts the press into a fully automatic machine.

The frame is constructed of close-grained, extra heavy cast semi-steel. It has a one-piece, heat-treated alloy crankshaft, split bronze-bushed main bearings, and greater ram area. The Famco model 59 press is fitted with belt and flywheel guard and can be furnished with two-hand safety push-button controls if desired. For further information write the Famco Machine Co., Kenosha, Wis.

T-6-1042



Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALLOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

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ARMSTRONG BROS. TOOL CO.

"The Tool Holder People" 5251 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

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Are you interested in saving up to 50% in your inspection time, also extending for many years the useful life of expensive gage blocks?

The above is being accomplished in many of the largest manufacturing companies in the country by the use of the Pioneer Tool gage block jack.

Designers and manufacturers of tools, dies, gages, fixtures, special machines, optical checking equipment and precision instrumentation parts.



PIONEER TOOL & ENG. CO.

3914-18 W. Shakespeare Ave.

Chicago 47, Illinois

INDICATE A-6-105-1

Small Magnetic Chucks

All the advantages of magnetic chucking are now made available for smaller machine tools and for bench work through the addition of three small electro-magnetic chucks to the line of magnetic chucks and devices manufactured by the Hanchett Magna-Lock Corp., Big Rapids, Mich.



These magnetic chucks, sizes 5 x 10 in., 6 x 12 in., and 6 x 18 in., facilitate holding workpieces for hand sawing, scraping, layout, filing, welding, drilling, grinding and similar operations. The chucks are precision-built, are of all steel construction and operate on a-c voltage. They have 22 percent more magnetic area, permitting pieces to be positively held to extreme edges of chuck. They are moisture proof and shock proof. Complete standard accessories are available. Full details may be had by writing to Dept. 360. **T-6-1051**

Hole Grinder

A small hole grinder which may be equipped for external work is now offered by Rivett Lathe & Grinder, Inc., Brighton 35 Boston, Mass.

The model 84 machine grinds holes from the smallest up to 3 in. in diameter, with a maximum 4-in. depth, depending upon the diameter; it grinds externally up to 3 in. in diameter with a length of 4 in.

Featuring flexibility of operation, the machine has interchangeable motor-driven wheelheads for internal and external spindles; the correct internal spindle with removable arbor, with chuck for mounted wheels, or with solid shaft, in speeds of 12,000 to 35,000 rpm, can be selected for the job; workhead or table can be swiveled for taper grinding; micrometer table stop can position work exactly for shoulder grinding, using fine hand table travel.

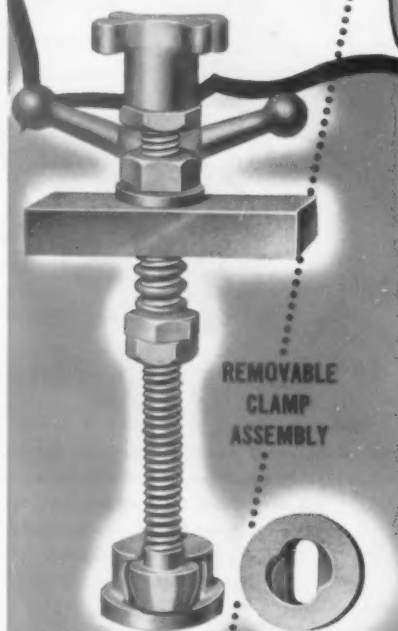
Other features contributing to accuracy, speed and diversification of work are: lathe-type spindle in workhead mounts draw-in collets or step chucks directly; lever closer for quick operation of collets and step chucks; mechanical power table travel with infinite speed and stroke adjustment within 1/4 to 4-in. stroke; hand table travel with both coarse and fine feeds to 0.001 in.; hand infeed with coarse adjustment to 0.001 in. and fine to 0.0001 in. reductions of work diameter.

T-6-1052

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DESIGN COSTS!**

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AND DETAILS.....**



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ASSEMBLY**

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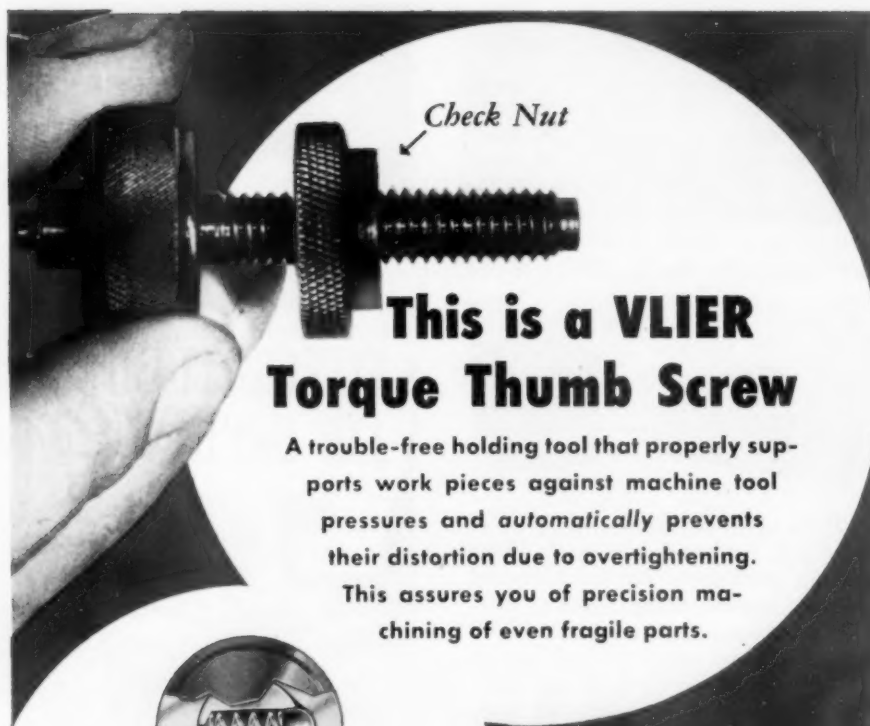
For our Catalog covering our complete line with full size templates of each product for tracing. Morton products can be adapted to specified changes.



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MACHINE WORKS**

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DETROIT 20, MICH.

INDICATE A-6-105-2



Check Nut

This is a VLIER Torque Thumb Screw

A trouble-free holding tool that properly supports work pieces against machine tool pressures and automatically prevents their distortion due to overtightening.

This assures you of precision machining of even fragile parts.



It Works Like This...

The free-rotating head contains a ball check that works against accurately controlled spring pressures. Upon arriving at the pre-determined holding pressure, the head rotates freely and prevents overtightening of the screw. "Tight is tight enough!"

And These Are the Mechanical Details

Body thread is National Coarse Series Class No. 1 fit. Check nut provided on most sizes prevents backing off under chatter. Holding pressures range from 0-50 lbs. Accuracy and uniformity guaranteed. Made of hardened and rust-proof selected steels. Nothing to wear or break.

Available in Four Types

1. Regular—Type A—for normal supporting.
2. Inverted—Type B—Reverse of Type A support.
3. Tee Head—Type C—used with sliding V-Blocks.
4. Adjustable—Type D—set your own holding pressures.

There is a nearby Vlier distributor to serve you. Write today for Catalog No. 53 which includes Spring Plungers, Spring Stops, Fixture Keys and Toggle Pads



**VLIER
MANUFACTURING
COMPANY**

4552 Beverly Boulevard, Los Angeles 4, California

Industrial Trailer

The 15-ton capacity trailer is designed and built by The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio, for use as an assembly dolly in the line production of heavy equipment. The trailer is tractor-drawn from one station on the line to the next. Its unusual wheel suspension, with each four

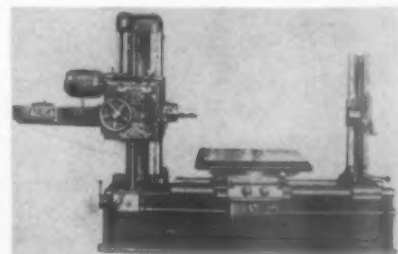


wheel truck mounted on a heavy swivel, provides uniform load distribution at all times. This, in turn, permits use to full rated capacity over rough floors and across yard areas which would ordinarily cause wheel or axle failure by intermittently concentrating the load on a single wheel.

The same general design is available in other capacities, and with other types of superstructure for handling plate in steel mills, for handling scrap beyond the range of yard cranes, and for similar applications. **T-6-1061**

Boring Machine

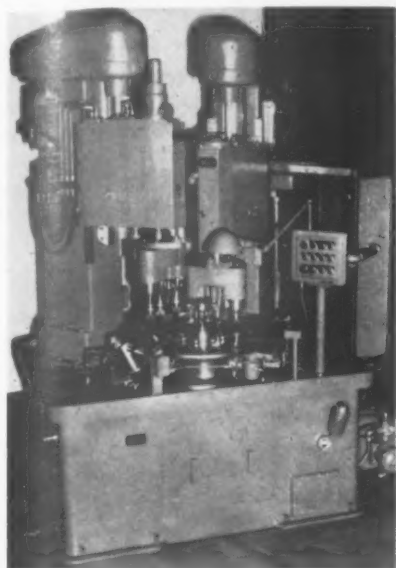
The Italica boring machine is manufactured by Rovai Jori of Italy. The head slides along a ground column which is rigidly bolted to the bed, and has a scale with vernier and lens.



Speed changes are accomplished through a series of honed alloy steel gears immersed in an oil bath and mounted on roller bearings. The revolving table is of heavy steel designed for minimum deflection under heavy loads. It may be displaced both horizontally and longitudinally, and revolves on the carriage about a large, graduated base. The chuck is mounted and supported by two bushings and an adjustable bronze taper bearing. Axial thrust is absorbed by thrust bearings mounted to the back support. For further information, write to British Industries Corp., International Machinery Div., 164 Duane St., New York 13. **T-6-1062**

Hydraulic Machine

A hydraulic drilling, reaming, tapping and threading machine, model No. 75, is announced by the Kaufman Mfg. Co., Manitowoc, Wis. The unit has electrical controls which conform to JIC standards.



A very fast index can be furnished with any number of divisions and the table has built-in self-centering three-jaw chucks. An alternative is two-jaw self-centering chucks mounted on top and hydraulically operated so that they will automatically close before going through the first operation.

The drilling side of the machine is driven by a five hp motor while the tapping side has a three hp motor drive through a three-step V-belt cone pulley arrangement. Pickoff gears provide speeds in 12 steps from 240 to 1328 rpm.

It is not necessary to depend upon the reversals of the motor for the tapping operation which is accomplished through a tapered cone clutch.

T-6-1071

Copper-Silver Alloy

A high strength copper-silver bronze with high electrical conductivity is being produced by Handy & Harman, 82 Fulton St., New York 38. This alloy, containing 94 percent copper and 6 percent silver, is sold only in the heat-treated and cold-worked condition. The drastic cold working of the heat-treated alloy develops tensile strengths ranging from 140,000 to 165,000 psi and electrical conductivity of 70 percent International Annealed Copper Standard. It is produced in round wire 0.160 in. in diameter down to the fine gages of magnet wire and in flat wire of equivalent cross section area having a maximum width of 1/2 in.

T-6-1072



Available in two sizes,
6" and 12" throat depth

Now you can punch holes of various shapes as large as 4" diameter in 16 gauge steel—also blank, draw, emboss, form—all with the new DI-ACRO Punch. It is ideal for both experimental and production work.

The precision ground triangular ram of this double purpose press prevents punch head from turning, assuring perfect alignment at all times for accuracy in duplicated parts.

A Turret Stripper of exclusive DI-ACRO design automatically strips material from punches of all shapes. Roller Bearing cam action develops 4-ton pressure with minimum effort. Adjustable gauges assure exact location of holes.

Send for "DIE-LESS DUPLICATING" Catalog

Gives the full story of the DI-ACRO Punch, and also DI-ACRO Benders, Brakes, Shears, Rod Parters, Rollers, Notchers, as well as the new DI-ACRO Vari-O-Speed Powershear and Hydra-Power Bender.



DI-ACRO is pronounced "DIE-ACK-RO"

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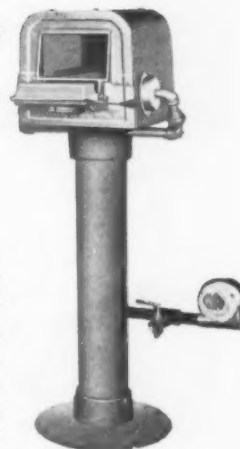
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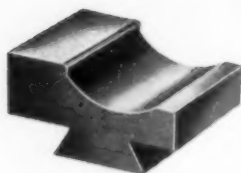
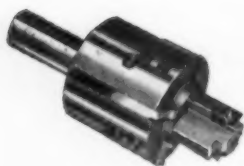
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FURNACES FOR INDUSTRY

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Welding Positioner

The model 21 precision automatic welding positioner is designed for precision automatic welding. The table rotates at any infinitely variable speed from zero to 2.7 rpm, and at 4 rpm constant speed for quick positioning. Either variable or constant speed is immediately available on a remote push-button control station. Precise table speeds are indicated on an electric generator tachometer. Speeds can be read as close as 0.025 rpm with no fluctuation of the knife-edge needle. The rotation motor is running during the welding cycle. This allows instant start and stop of the table through I.C.B. electric clutches and brake. The two hp motor provides forward or reverse rotation. By depressing the positioning button, the table rotates at 4 rpm. By depressing the variable button, the table will rotate at the desired preset speed.

The table tilt is accomplished through a three hp brake motor affording instant stopping. The table tilts 135 deg in 23.4 seconds. Precision limit switches control the degree where the table will stop, either tilt or flat.

The entire body of the positioner raises 24 in. This is accomplished through a three hp brake motor. Guide rollers elevate on two columns through a rack and pinion. Precision limit switches control desired height both top and bottom. For further information, write to the Aronson Machine Co., Arcade, N. Y. **T-6-1081**

Portable Unloader

The Sahlin Engineering Co., Birmingham, Mich., has introduced a portable unloader which can be wheeled up to small and medium size presses for automatic removal of small parts. The machine, which consists of a jaw, air cylinder and electric control assemblies, can be adjusted up and down to reach various die levels and can be set at any angle required. Jaw travel is in a straight line and is especially suited for the removal of small parts at high speed. Due to its portability, high speed and safety features, the unloader is expected to find wide usage on applications where it is impractical to eject parts mechanically or through a bed opening or by gravity.

Operation of the new unloader is as follows: When the ram descends and completes the forming or shearing operation, the steel jaw moves into the die and takes a firm hold on the stamping the moment the ram rises sufficiently. The jaw lifts stamping, moves back out of the die and drops the stamping in a tote box or onto a conveyor. It then returns to its original position to await the next cycle. **T-6-1082**

Profiling Machine

The Wade Tool Co. of Waltham, Mass. announces several new features that have been embodied in their motor-driven precision profiler. It is now much heavier, and has a powerful V-belt drive. Previously offered for bench mounting only, a pedestal metal cabinet has been designed as optional equipment.



The Wade profiler has new cutter holder collets with improved grip. The same collet is used in the follower spindle. A follower spindle parallel with the main spindle holds the follower spindle cutter for producing templets from samples.

The profiler requires a floor space 24 x 26 in. and is 57 in. high. A standard 1750-rpm, 1/3-hp, 3-phase motor provides eight spindle speeds, ranging from 437 to 7000 rpm.

The working area is 2 x 4 in. horizontal, 1 1/4 in. vertical. **T-6-1091**

Flow Meters

The Bristol Co., Waterbury 20, Conn., announces its new line of series 500 open channel flow meters for measuring, recording, and controlling the flow of water, sewage, industrial plant effluent, irrigation water, and other liquids. The flow is determined by measuring the head of liquid flowing through a flume or over a weir in the flow channel. This measurement of head is interpreted by means of a cam, cut to the equation of the weir or flume, into terms of flow, which is then recorded on a uniform chart and integrated if desired.

Two general types are offered. In the mechanical type, the cam mechanically moves the pen arm across the chart. The electric type employs the Bristol timed-impulse type of remote recording. With this type, the record can be made at any distance from the point of measurement. The impulses are transmitted by a pair of conductors. **T-6-1092**

Rolling Large Diameter Threads on 5" Rocket Motor Nozzle



Threading 4 to 6 Parts per minute

The Reed Thread Roller has overcome major threading problems in the producing of 4 3/4" — 12 threads on 5" Rocket Motor Nozzles. With the previous production methods, difficulty had been encountered in obtaining squareness and 100% inspection was required for accuracy and smoothness.

The Reed A32 Cylindrical Die Thread Roller produces accurate threads that are much smoother and have a high degree of surface finish. Squareness of the thread with the shoulder is held to within one-half of the required tolerance with simple tooling. Production is at the rate of 4 to 6 threaded parts per minute.

Only spot checking of the threads is now required, and inspection costs have been reduced over 65%.

Send us specifications of your requirements and let us supply you with complete information.

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TE-023

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More efficient than conventional single diamond tools—**with MUCH LONGER LIFE.**

Reduces set-up time—increases production.

Now ready and proven: Koebelite CDP (Cemented Diamond Particles) Tool for Ex-Cell-O and J & L Thread Grinders, pictured above.

KOEBEL DIAMOND TOOL COMPANY

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FIRST to give diamond users the advantage of diamonds set in powdered metal.

INDICATE A-6-110-1

Midget Calculator



A portable calculator—"the Curta"—that carries to five decimal places and totals to 99 billions, should be of especial interest to engineers, designers and tool checkers. Cylindrical and so small that it can be gripped in the hand, this precision-made Swiss calculator adds, subtracts, multiplies, divides and further figures percentages in addition to factors, square and cube roots. For information, write the Curta Calculator Co., 5543 South Ashland Ave., Chicago. **T-6-1101**

Synthetic Cutting Fluid

Ucon cutting fluid H-660, a synthetic cutting fluid that forms a clear solution with all proportions of water at room temperature, has been announced by Carbide and Carbon Chemical Co., a division of Union Carbide and Carbon Corp., 30 East 42nd St., New York 17. The exceptional clearness of water solutions of this fluid allows excellent visibility of the work being cut or ground.

Use of Ucon cutting fluid H-660 produces cooler workpieces, resulting in faster cutting, less tool burning, longer tool life, closer tolerances, and better finishes, even with hard or tough metals and alloys, according to the maker.

Ucon cutting fluid H-660 can be rinsed from metal surfaces with cold water or vaporized in subsequent high-temperature, heat-treating operations. However, fluid left on parts provides a rust-protective coating, and the inhibitors in the fluid are effective in water solutions.

The cutting fluid may be used with or without water dilution. In general, a solution of one part of the fluid in 2 to 2½ parts of water has worked best, but the dilution ratio may be adjusted to meet specific requirements. In grinding operations, one part of the fluid in 25 to 33 parts of water has produced excellent results in terms of grinding-wheel corner-wear, and resistance to forming and metal burning. **T-6-1102**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

New XL BOND
FOR CARBIDE TOOL AND CUTTER

Grinding



Another Chicago Wheel FIRST

"XL" is Chicago Wheel's exclusive new bond for silicon carbide vitrified grinding wheels, especially made for grinding carbide cutting tools. Supplied in most popular sizes and steel backs. Prompt delivery. Keep your production up . . . costs down, with "XL."



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CHICAGO WHEEL & Mfg. Co.

Dept. TE, 1101 W. Monroe St., Chicago 7
INDICATE A-6-110-2

The Tool Engineer

Drilling Machine

A drilling machine, designed to simplify set-up and speed drilling operations, is announced by Barnes Drill Co., 870 Chestnut St., Rockford, Ill.



Of sturdy, rugged construction throughout, this machine features the BarnesdrilL syncro-torque drive, providing constant full-rate horsepower delivery under all conditions of speeds and feeds. As a result the user has instantly available a wide range of infinitely variable feeds and speeds at full-power capacity.

The first of a series, the machine has a 21-in. swing and 1 1/4-in. capacity in steel. Full details may be obtained by writing Department OOOO. **T-6-1111**

Fixture Lock

A screwless, quick-acting locking device for adapting to jigs and fixtures that does away with slow screw type clamps and holding tools, has been announced by the National Machine Tool Co., Racine, Wis.

A simple push or pull on the bar knob sets the device at any position between fully open or fully closed. A light press on the locking lever gives an extra forceful forward motion to the bar exerting a holding pressure up to 1500 pounds. This quick, sure-setting feature can speed production and cut tooling costs. It makes jig and fixture designing easier, and does away with special locking details. Full and half scale templet sheets are provided by the manufacturer.

The Heinrich Grip-Master fixture lock is adaptable to a wide range of machining and assembling operations using metal, wood or plastic stocks. The long stroke provides wide work clearance. A one-inch portion of the end of the bar has been left soft by the manufacturer, permitting machining to fit the device to specific jobs. **T-6-1112**

*All Lovejoy Blades for
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4 1/2" to 24" in diameter*

... and this applies to
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TOOL COMPANY, INC.**

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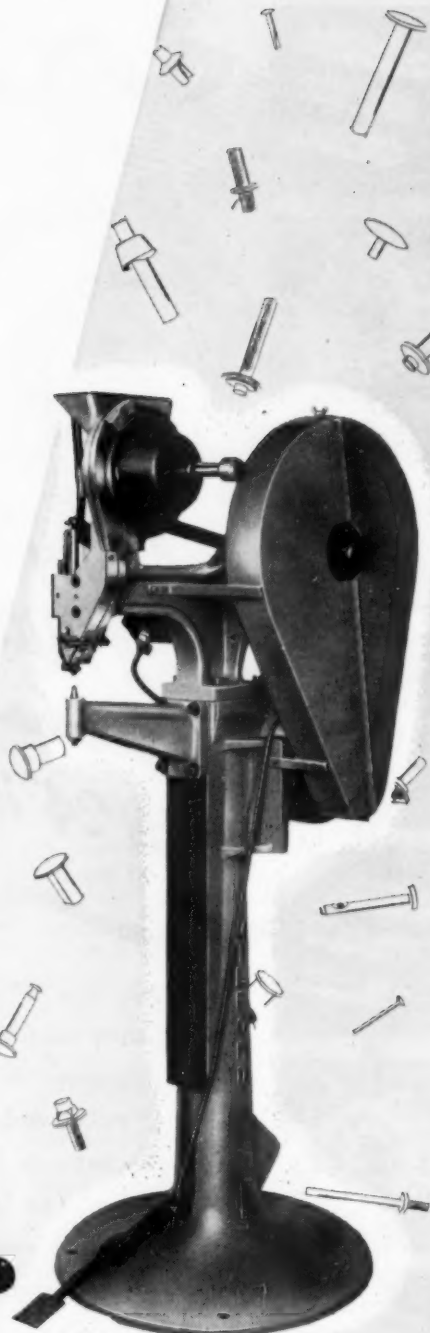


ELYRIA, O., 1118 W. River Street



HATBORO, PA., 38 Platt Street

FOR FURTHER INFORMATION, USE READER SERVICE CARD INDICATE A-6-112



Free-Running Locknut

A seating type all metal, free-running, self-energizing locknut that is usable over and over, is offered by Klincher-Locknut Corp., 2153 Hillside Ave., Indianapolis, Ind. The grooved washer at the bottom of the nut is pressed over the threaded section suspended from the main body of the nut. This nut is manufactured in various materials and will withstand temperatures up to 1600 deg F without thread seizure.



The nut spins freely on the bolt down to the work. After the proper torque has been applied, the washer compresses, causing the threaded section inside the washer to move in and lock radially on the bolt. When the threaded section inside the washer picks up all the load it can carry, it elongates a few thousandths of an inch, permitting the bulk of the load to move up into the main body of the nut. This reduces the high stress concentration and torsional load normally found in the first three threads in the nut and bolt, permitting more wrench torque to be applied before exceeding the elasticity in the bolt.

T-6-1121

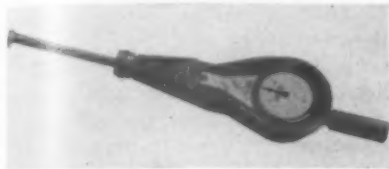
Dy/Chek Formula

Completion of an improved and non-toxic Dy/Chek formula was announced recently by Turco Products, Inc., manufacturers of the dye penetrant inspection process.

The Dy/Chek method of inspection is basically a hide and seek process. After pre-cleaning, a red dye is applied to the surface being inspected. After being allowed to dwell sufficiently long for it to "hide" in any flaw or defect, no matter how small, that extends to the surface, the dye is removed from the surface of the part being inspected. A white developer is then applied to the surface being inspected. This developer seeks out the dye hidden in the flaw. As the developer dries, it pulls the hidden dye to the surface. The red dye thus bleeds into the white developer, marking with photographic clarity any defects, as well as their extent, that may be present. **T-6-1122**

Small Bore Dial Gage

Standard Gage Co., Inc., Poughkeepsie, N. Y. has developed and is now producing a dial bore gage designed for the quick, accurate inspection of small diameter bores from 0.250 in. to 0.375 in. This addition to Standard's line of dial bore gages, known as model No. 00, is designed to check tolerances up to 0.005 in.



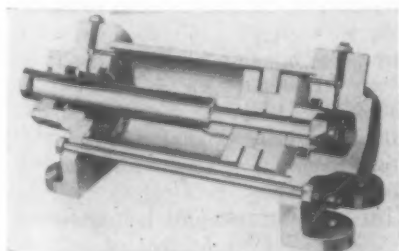
The Standard No. 00 dial bore gage utilizes interchangeable centering-size discs. These discs, which attach firmly to the head of the instrument and are locked securely in place by means of a knurled clamping nut, are made a few thousandths of an inch smaller than the bore to be gaged, and can be quickly interchanged for dimension changes by the one-step operation of simply turning the clamping nut. Positive locking action of this nut insures holding the set dimension. Centering-size discs are furnished to meet the dimensions of the bore to be checked in various sizes in the range from 0.250 in. to 0.375 in.

The dial indicator, which in this gage is hooded as protection against accidental knocks, has high visibility graduations of 0.0001 in. The plunger actuating the indicator is sapphire-tipped and the centering-size discs are chromium plated to assure long wear life.

T-6-1131

Air Cylinder

A line of T-J Super Cushion air cylinders, designed with an application of flexible cushion sealing, is announced by The Tomkins-Johnson Co., Jackson, Mich.



The sealing element has been thoroughly tested in the field through millions of operating cycles under rigid and exacting conditions. Results have shown that the T-J flexible cushion seal insures positive cushion action, combined with automatic valving action for fast return stroke. Although wear

on the sealing element is practically non-existent, it automatically compensates for wear by its sealing-with-pressure characteristics. Also, because of the cushion design, the friction factor is lower which results in added power due to higher efficiency.

The T-J cylinder employs a new-type packing nut, incorporating a piloted diameter which assures perfect alignment. The female adaptor feature is an integral part of the packing nut. This packing nut adds rod bearing length, eliminates necessity of separate female adaptor ring, and minimizes the

stocking of rod packing component parts.

The metallic male adaptor ring used in the piston rod stuffing box gives added support to the chevron type packing, thereby extending life of rod packing and increasing sealing efficiency.

Basic design of the cylinder is safety-stressed for air line pressures up to 100 psi. The cylinder is available in seven standard styles for all types of mounting requirements. Capacities are from 100 to 12,000 lb. for power movement in any direction.

T-6-1132

YOU PAY FOR THE BEST . . . BE SURE YOU GET THE BEST

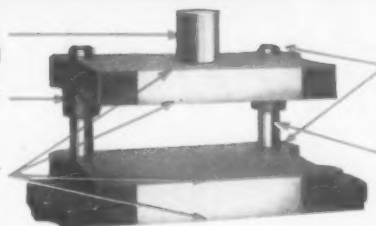
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THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

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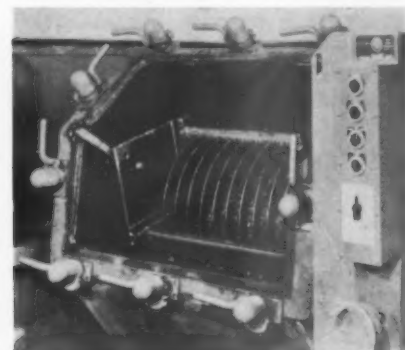
Granite Surface Plates

An improvement in lapping granite surface plates has been developed by lapidary engineers of Collins Microflat Co., 2326 E. 8th St., Los Angeles 21. Seizure of gage blocks and checking fixtures, which has occasionally occurred when using granite surface plates, has now been eliminated by a method of lapping to provide a continuous bearing surface interspersed with micronic valleys. These minute reliefs, formed by an exclusive lapping procedure, afford sufficient air pocket relief between bearing surfaces to prevent seizure of instruments. The subdivisions of the grain pattern are so small as to be invisible to the naked eye.

Microflat black granite surface plates, formerly distributed by the DoAll Co., are now made available through a network of newly appointed factory representatives. **T-6-1141**

Finishing Machine

An addition to the line of Mechanical Finishing machines manufactured by the Roto-Finish Co., Kalamazoo, Mich., is the new DW 30-36-1SF. Designed to effectively finish disc type circular parts at a low cost, the machine, of the stationary fixture type, uses the directional flow of the finishing media to uniformly produce desirable results.



Model DW 30-36-1SF has a single 30 $\frac{1}{8}$ x35 $\frac{3}{4}$ -in. ID rubber-lined compartment with an 18 cubic foot capacity. Large door opening facilitates handling of the large parts for which the machine was designed. Patented quick action cam locks, used for closing the compartment door, have spring-loaded pressure releases.

The unit features push-button operation with all controls located on one compact panel. Once the machine is started, an automatic timer is available for controlling the operation from 0 to 20 hours without attention by an operator. A variable speed power unit with a conveniently located remote control handle enables the operator to vary the speed of the cylinder from 10 to 20 revolutions per minute. **T-6-1142**

Two Tools in One

A lathe tailstock centering device and taper turning attachment has been placed on the market by Master-Taper Co., 4531 No. Beacon St., Chicago 40. This attachment is manufactured in two sizes, one with a No. 2 Morse taper shank and the other with No. 3, 4 or 5 Morse taper shank. This range of sizes



is applicable to lathes from bench type to extra heavy duty. The attachment fits into the tailstock, eliminating any special fitting or machining for immediate use. The micro screw (with graduations) actuates the 60-deg center in either direction with a positive lock at any position desired. The maker states that this tool does away with the time wasted at present in alignment of the tailstock center and also is utilized to turn tapers up to 3 inches per foot, using the graduations indicated on the face plate.

T-6-1151

Floating Tap Holder

The JT floating tap holder is designed for use in multiple spindle machines. It has a double gear spline drive coupling for the neutralizing or intermediate driving member. Clearance between mating splines allows free movement at all times. Two thrust bearings, placed close together and separated from the drive, minimize the effect of the force applied on the tool by the hole and permit taps to float freely into alignment.

Other features of the JT floating tap holder are small body diameter for operations on close centers; short projection requiring less space between spindle and work; collet split on 4 sides centers tap by the shank, reduces strain and tap damage; quick-lock nut locking any place on the threaded adapter shank making it easy to make adjustments; balls free to move or rotate around the collet, thus reducing scrubbing action characteristic of small rocking movements.

For information, write Scully-Jones and Co., 1915 So. Rockwell St., Chicago 8.

T-6-1152

**ACCURATE
SQUARES**

**CONCENTRIC
SHANKS**

**UNIFORM
FLUTE
SPACING**

**CONTROLLED
HOOK**

**PRECISION
GROUND
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**JARVIS
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AT NO
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COST!**

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BORING BITS**

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MEASURE IN MICROINCHES RMS

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because



uses the **PROFILOMETER**

Bell Aircraft Corporation of Buffalo, New York, in production of Guided Missiles, Supersonic Aircraft, Rocket Motors and Airborne Electronic Equipment finds the Profilometer has increased their production efficiency. At Bell the development of guided missiles is of great magnitude. While the work in this field is of a restricted nature, it can be reported that the Profilometer has become of standard use in production techniques.

A specific example is Bell Aircraft production of high precision valves. Extreme surface accuracy in machining these high precision valves is of prime importance. For these surface measurements Bell turned to the Profilometer for the necessary answers. The I.D. surface of these valves, shown being measured above, must produce a maximum reading of four microinches! Bell found that the Profilometer would give these readings fast and accurately thus saving valuable machining time in production.



Extremely accurate surface measurement is essential to Bell Aircraft today in research and production. The Profilometer is supplying this information. This is just another example of the use of the Profilometer as an important shop instrument.

To learn how the Profilometer can help cut costs in your production, write today for these free bulletins.

Profilometer is a registered trade name.

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Magnetic Brake

A magnetic design that eliminates all levers and linkage found in conventional units has been developed by the Reuland Electric Co., Alhambra, Calif. This brake contains only six major operating parts and features a direct, automatic set and release action between the solenoid and armature.



In addition to this operational feature, the solenoid is of a one-piece "doughnut" design that permits the motor's output shaft to extend completely through the brake. This feature permits the user to utilize both ends of the motor shaft for powering two pieces of equipment when desired.

Reuland magnetic brakes are also suited to fluid coupled motors and gear reducers because of this feature. The brake is installed on the output shaft of the fluid coupling with the shaft extending through the brake for hook-up to the load.

These magnetic brakes are available in 3, 10 and 25 foot-pound continuous duty ratings; 15 and 35 foot-pound intermittent duty types. They can be mounted on standard Reuland motors or on other motors by means of regular Reuland mounting methods, or to NEMA "C" face type endbells.

T-6-1161

Portable Indicator

A portable surface-resistance indicator, designed to help produce a better resistance welding bond by providing a rapid and accurate measurement of the resistance between pieces of metal to be welded, has been announced by the Special Products Div. of the General Electric Co.

The device supplies a simple check on pre-welding cleaning processes, upon which the surface resistance of the metal depends.

The equipment comprises two parts, a microhmmeter and a sample holder. The sample holder consists of a hydraulic ram which has a pair of current electrodes, emf electrodes, and a pressure gage. The emf electrodes are so spaced as to make the measurement independent of sample size.

The unit has two ranges: 0-200 and 0-2000 microhms. The measured resistance is indicated directly in microhms on a linear 100 division scale. Voltage fluctuations in the supply mains do not affect the reading. **T-6-1162**

PUMPS

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LUBRICANTS, AND
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AND
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& MANUFACTURING CO., INC.

19645 JOHN R STREET
DETROIT 3, MICHIGAN

WRITE FOR CATALOG

Diamond Wheel Dresser

The Eastern Tool Co., East Hartford, Conn., has just marketed a new diamond wheel dressing machine, one designed to prolong up to 50 percent the life of any diamond wheel. Easily mounted on a work table and engineered to conveniently dress wheels on



spindles, the product dresses radii, periphery and angles from $+0.00025$ to -0.0005 in. New cutting edges are exposed with an absolute minimum removal of stock. A true running wheel is constantly assured. Featured also is a double row bearing and a single row bearing on the shaft for a positive true turning wheel, a motor designed to give the correct speed and hp, a vernier scale for quick, precise angle setting.

T-6-1171

Cylindrical Grinder

A cylindrical grinding machine with accuracy up to 0.00004 in. is announced by Albert Klingelhofer Machine Tool Corp., Westfield, N. J. The machine is German made and is designated as MSO cylindrical grinder, Model FH-200.

These machines are furnished with in-feed controls that assure quick and precise grinding on a high-production basis and in addition to the Model FH-200, there are two other sizes immediately available. Some of the usual operating procedures are as follows: longitudinal grinding with in-feed by hand or power at each reversal of the table; plunge-cut grinding with automatic grinding and quick return traverse of the wheel-head by hand adjustment of the main lever; plunge-cut grinding by means of a deferring relay with automatic disengaging of the table. The rotary work movement and the coolant supply stop automatically when the sparks have disappeared. This is followed by a quick return traverse of the wheel-head; plunge-cut grinding by means of an electrical size-grinding device, which automatically disengages the table, stops the rotary movement of the work and the coolant supply. This is followed by a quick return traverse of the wheel-head.

T-6-1172

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YOUR PRODUCT

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TO TOOL AND EQUIP YOUR
PLANT FOR THE BEST
PRODUCTION ECONOMICS

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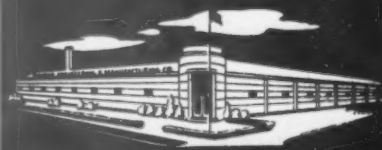
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PRODUCTION GOING
AND KEEP IT GOING

ENGINEERS

TO REDUCE YOUR COSTS
AND
IMPROVE YOUR QUALITY



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INQUIRIES PROMPTLY ANSWERED

INDICATE A-6-117-2

INDICATE A-6-117-1

TRADE LITERATURE

Free Booklets and Catalogs
Currently Offered By Manufacturers

Gas, Air Line Cleaner

Explanation of the two basic mechanical cleansing actions, descriptions of typical installations, and discussions of how to select the proper size equipment are all included in catalog 252 dealing with the Aridifier, a mechanical cleaner to remove oil, moisture and dirt from compressed gas and air lines. Widely illustrated for clarity. **Logan Engineering Co.,** Aridifier Div., 4901 W. Lawrence Ave., Chicago 30. **L-6-1**

Filter, Coolant

Two models—ramp and bottom discharge types—self-cleaning web-type filters for individual machine tools or small central coolant systems are described and illustrated in 4-page bulletin showing special advantages and exclusive engineering features said to result in cost cuts up to 75 percent. Specifications for both models included. **Honan-Crane Corp.,** 676 Wabash Ave., Lebanon, Ind. **L-6-2**

Floor Drill

Pamphlet D-110 introduces C-0 Cincinnati 14 in.-3000^{tr} sliding head floor drill with tilting motor bracket for easy speed changes; engineering and cut-away drawings, as well as specifications, included. **Cincinnati Lathe & Tool Co.,** Oakley, Cincinnati 9. **L-6-3**

Switches, Pyrometric

Catalog 5800 illustrates and describes rotary, key and plug type pyrometric switches; gives applications and pertinent circuits and also includes dimensions, mounting details and switch circuits. **Minneapolis-Honeywell Regulator Co.,** Brown Instruments Div., Wayne and Windrim Aves., Philadelphia 44. **L-6-4**

Pumps

Reference chart on small pump applications lists various types of Tuthill pumps, services for which each is built, performance characteristics, types of packing, styles of mounting and distinguishing features of each model. **Tuthill Pump Co.,** 939 E. 95th St., Chicago 19. **L-6-5**

Metal Shaper

Handbook "How to Run a Metal Working Shaper" designed as an aid to the experienced machinist as well as the apprentice and student; photos, diagrams and exploded views show internal parts of equipment, how to grind differently formed tool bits for shaper cuts and how to handle job set-ups used in shaper work. Simple, easy-to-follow steps outline procedure. **South Bend Lathe Works,** South Bend 22, Ind. 25¢. **L-6-6**

Presswork Aid

Bulletin 38, revised 52-page "Computations for Metal-Working in Presses" aimed at helping engineers and shopmen, contains necessary data to compute pressure capacity and sustained work capacity of various mechanical and hydraulic presses. Series of alignment diagrams to simplify making these computations have been prepared from such formulae as could be developed. **E. W. Bliss Co.,** Canton, Ohio. **L-6-7**

Die Casting

Details of Model 400 Cleveland universal high pressure hydraulic die casting machine presented in brochure illustrating and describing all parts of equipment and outlining "35 points of superiority." **The Cleveland Automatic Machine Co.,** Cincinnati 12. **L-6-8**



Hole Location Practices

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc., 732 Union Avenue, Bridgeport 7, Conn., builders of Jig Bore, Jig Grinders, Panto-Crumb Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

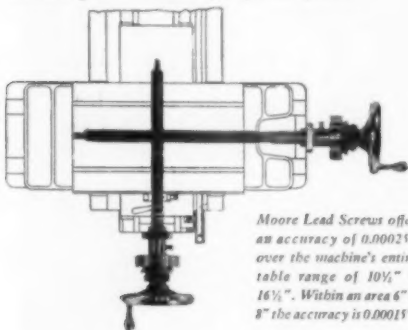
MEASURING WITH ACCURATE LEAD SCREWS

Every measuring system, whether it includes a graduated scale, end measures, or a stepped bar, depends for its accuracy on a screw. This is quite understandable, in view of the following reasons:

1. The lead screw is the only length standard capable of stepless measurement over its entire length.
2. It is the only length standard capable of translating its accuracy into both movement and location.
3. It is the only length standard which is, in itself, a complete measuring system, requiring no auxiliary equipment to make it usable.

The measuring system employed in Moore Jig Bore and Moore Jig Grinders depends only on the accuracy of lead screws. This system has the following advantages:

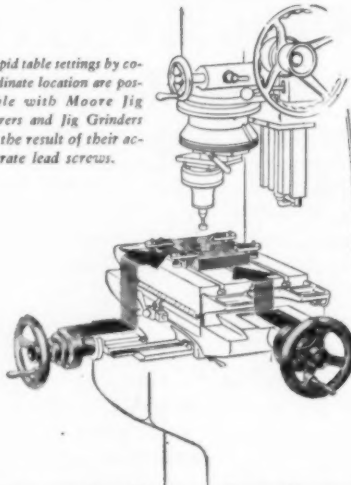
1. The lead screw provides a single standard of responsibility for accuracy.
2. Elimination of additional elements cuts down unnecessary sources of error.
3. The accuracy of Moore lead screws cannot be surpassed by any other more indirect system in practical use.
4. The directness and simplicity of measurement surpass that of any other method. This is insurance against operator error, in spite of the more rapid operation possible.



Moore Lead Screws offer an accuracy of 0.00025" over the machine's entire table range of 10 1/4" x 16 1/2". Within an area 6" x 8" the accuracy is 0.00015".

Accurate lead screws have been installed in over 1500 Moore Jig Bore and Moore Jig Grinders. Tests made on lead screws of Moore machines, in constant use for long periods, reveal that wear on the screws is negligible for 10

Rapid table settings by co-ordinate location are possible with Moore Jig Bore and Jig Grinders as the result of their accurate lead screws.



years or more. Several factors contribute to this: movement of table and slide is almost frictionless, resulting in very low pressure against the threads; screws, since they are completely enclosed and lubricated through felt filtering plugs, are kept constantly clean. Screws can be checked periodically; and, if wear is found after years of use, they can be replaced at nominal costs. This could not begin to overshadow the advantages of lead screws, even if replacement were necessary more often.

TWO TOOLROOM ACES

In the Toolroom and on the Production Line, the Moore Jig Bore and Moore Jig Grinder team up for speed and accuracy. Both operate on the principle of accurate lead screws, as described above. Write today for descriptive literature on both machines and their performance. **Moore Special Tool Company, Inc.,** 732 Union Avenue, Bridgeport 7, Conn.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-118

Blast Cleaning

Bulletin 844, "Continuous Airless Blast Cleaning," deals particularly with the problem of cleaning relatively large tonnages on a production basis, explaining the process of continuous blasting and illustrating how it is applied in actual practice. **American Wheelabrator & Equipment Corp.**, 1182 S. Byrkit St., Mishawaka, Ind. **L-6-9**

Surface Grinding

Illustrated pocket-size handbook "ABC of Surface Grinding" presents extensive information of such topics as grinding know-how, with explanations of operations of various types machines; wheel selection for each job, along with data tables giving wheel recommendations for specific materials; trouble shooting and how to avoid or correct common faults. **Norton Co.**, Worcester 6, Mass. **L-6-10**

Flame-Hardening

Efficient and economical method of hardening steel parts is subject of eight-page booklet, "Flame-Hardening—A Flexible Method of Surface Treatment"; illustrations of different types of applications show variations possible obtainable from the process. **Linde Air Products Co.**, Div. Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17. **L-6-11**

Cleaning, Metal

"Scientific Cleaning for Modern Metal Finishing" explains how principle of Kelite pH Control may be utilized to streamline most cleaning and processing jobs; includes helpful information pertinent to both simple and complicated cleaning problems for either ferrous and nonferrous metals. **Kelite Products, Inc.**, 1250 N. Main St., Los Angeles 12. **L-6-12**

Coolant Separator

Widely illustrated brochure deals with BarnesdriL magnetic coolant separator for automatically cleaning coolant on metal finishing operations, showing production convenience and savings, and special applications possible to fit varying requirements. **Barnes Drill Co.**, 814-830 Chestnut St., Rockford, Ill. **L-6-13**

Drilling and Taping

Leaflet explains four specialized functions of electronic motor-drive accessory VSC control panel showing it in action; functions include timed-rate acceleration and deceleration and speed-changing, pre-set speed selection, automatic speed-changing and improved speed regulation for adjustable-voltage drives. **Reliance Electric and Engineering Co.**, 1111 Ivanhoe Rd., Cleveland. **L-6-14**

Shears, Squaring

Four-page illustrated bulletin, 87-A deals with construction, outstanding features, specifications and operation of recently introduced air powered squaring shears. **Niagara Machine and Tool Works**, 637-697 Northland Ave., Buffalo 11. **L-6-15**

Wire Forming

Twelve-page illustrated bulletin gives details and specifications for automatic four-slide wire forming; for both wire and ribbon stock; shows examples of special forms that may be produced. **The Baird Machine Co.**, Bridgeport, Conn. **L-6-16**

Wheel Forming

Illustrated folder presents detailed information about Diaform wheel forming attachment emphasizing simplicity, speed and economy. Specifications included. **Pratt & Whitney Div. Niles-Bement-Pond Co.**, West Hartford 1, Conn. **L-6-17**

Cutting Tools

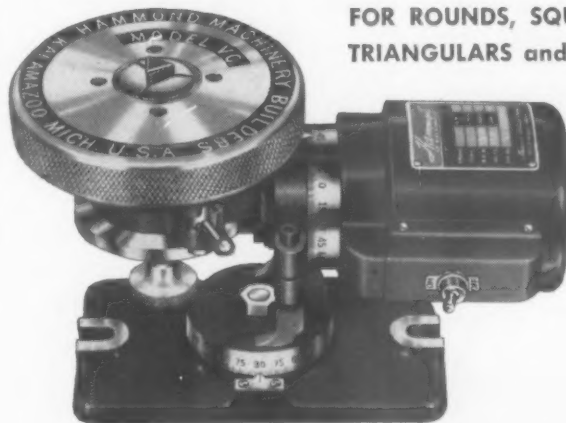
Four-page booklet, KL-52, gives full details on recently introduced line of mechanically mounted Klamp-Lok tools with vertically clamped Talide inserts, pointing out main features and advantages; prices included. **Metal Carbide Corp.**, Youngstown, Ohio. **L-6-18**

Hammond OF KALAMAZOO
GOOD MACHINERY SINCE '82

FAST ACCURATE GRINDING

of SOLID CARBIDE INSERT TOOLS

FOR ROUNDS, SQUARES,
TRIANGULARS and RECTANGULARS



MODEL VC, Style M Motorized Solid Carbide Insert Grinding Fixture. Style H, without motor also available. Write for Bulletin No. 701.



HAMMOND MODEL CB-77 CHIP BREAKER AND DIAMOND FINISHING GRINDER can be supplied with both the standard Any Angle Vise and the Model VC Solid Carbide Insert Grinding Fixture.

THE Hammond Solid Carbide Insert Grinding Fixture pays for itself in a few weeks. Offers a fast, economical and accurate means of grinding chip breaker grooves in round, square, triangular and rectangular shapes and for rough and finish grinding of dull and damaged carbide inserts. Motorized Style M with lug base can be mounted on most tool and surface grinders and Hammond C-4, CB-76 and CB-77 Chip Breaker Grinders.

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1661 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

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North East West South IN INDUSTRY

According to a recent announcement, **Morse G. Dial** has been elected president of **Union Carbide and Carbon Corp.** Mr. Dial, who has been associated with Union Carbide since 1929, has been vice-president of the company for the past year. He succeeds **Fred H. Haggerson** who continues as chairman of the board.

Also announced from Union Carbide, was the election of **Walter E. Remmers**

as vice-president, Alloys Division, and the election of **Kenneth H. Hannan** as treasurer. Mr. Remmers, who joined the corporation in 1936, has been president of Electro Metallurgical Co. and of United States Vanadium Co., both divisions of Union Carbide and Carbon. Mr. Hannan, who also has been with the firm for the past seventeen years, was formerly secretary and assistant treasurer.

Appointments of **O. S. Carliss** as director of engineering, and **George F. Quayle** as assistant director of engineering of the Philadelphia Div. of **The Yale & Towne Manufacturing Co.** were recently announced. Mr. Carliss recently has been serving as a special assistant to **Elmer F. Twyman**, vice-president of the company, and Mr. Quayle has been responsible for the engineering and design of Yale brand of manually-operated and battery-powered hand trucks. Mr. Carliss and Mr. Quayle succeed **Charles S. Schroeder** and **Frank A. Vossenberg** who were appointed Director and assistant director, respectively, of the newly created company-wide Research and Development Div. which was established to co-ordinate and supplement product development activities now being conducted at Yale & Towne's eight manufacturing divisions here and abroad.

John J. Hayes, Jr. recently was elected vice-president and general manager of the **Morse Twist Drill and Machine Co.**



John J. Hayes



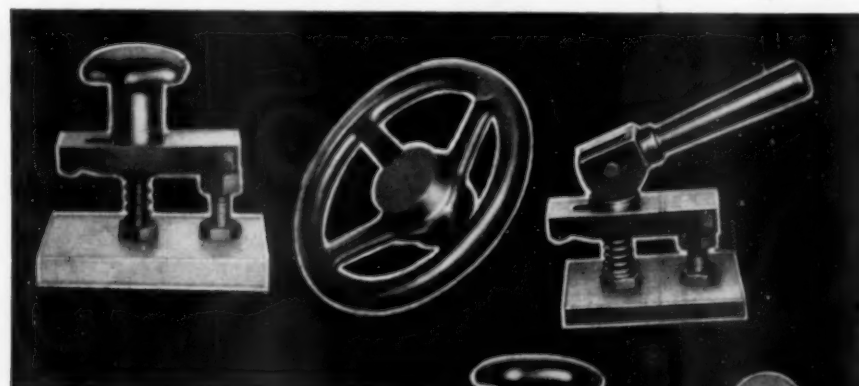
Donald H. Vance

According to recent announcement, **Donald H. Vance** has been elected vice-president of **The Korfund Company, Inc.** Mr. Vance, who joined Korfund in 1941, has also served as executive engineer and assistant general manager.

At the recent annual meeting of **Handy & Harman**, **Judson C. Travis** was elected vice-president and general manager and was given responsibility for all accounting and financial departments of the company.

At the same time, **Frank C. Jones**, Bridgeport plant manager, was elected vice-president in charge of production; and **Thomas H. Gallagher**, managing director and treasurer of the wholly-owned subsidiary, **Handy & Harman of Canada, Ltd.**, was elected to the board of directors, whose membership was increased from eight to nine.

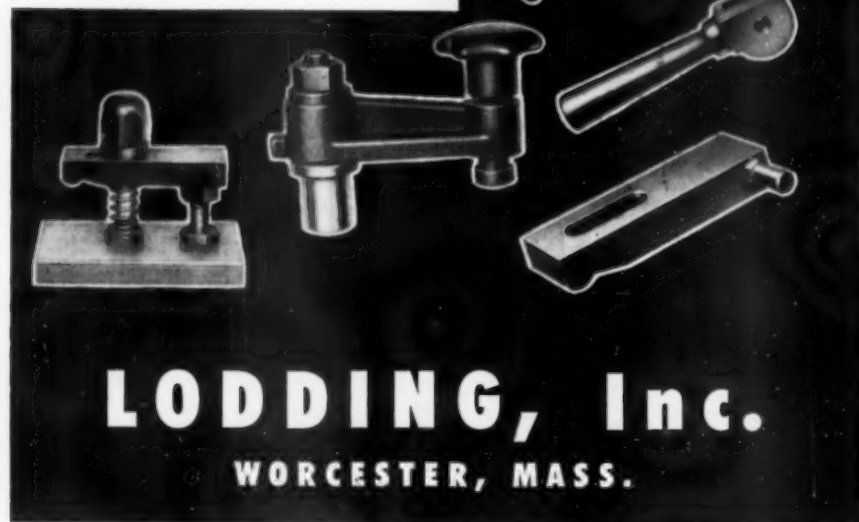
G. H. Niemeyer, who this year completes 52 years with **Handy & Harman**, was re-elected company president.



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YOU SAVE MONEY
YOU GET QUALITY
YOU GET QUICK SERVICE**

LODDING Clamp Assemblies and Standard Fixture Components are produced in quality and quantity. Forgings are used wherever practical. All parts are Parkerized for rust prevention.

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CATALOG AND TRACING TEMPLATES AVAILABLE UPON REQUEST.



LODDING, Inc.
WORCESTER, MASS.

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James V. Lester, controller of Standard Pressed Steel Co. for the past five years, was elected treasurer during the company's annual meeting. Mr. Lester takes the place of **Harald F. Gade**, one of the founders of SPS in 1903 and its senior vice-president and treasurer, who retired after 49 years as an officer of the company. Mr. Gade's son, **George A. Gade**, field sales manager for SPS, was elected to the board of directors.

The board of directors of **D. A. Stuart Oil Co., Ltd.**, Chicago, has elected **L. B. Perkins** vice-president and treasurer and also has appointed him general manager of the company.



L. B. Perkins



Arthur P. Davis

Arthur P. Davis has come back from retirement to serve as president of **Arma Corp.** following his election to that office by the directors after the annual stockholders' meeting. Mr. Davis previously held the presidency of the company which he founded with **David M. Mahood** 29 years ago, but had retired in 1947 following the strain of the war period.

Earlier, announcement from **Arma** named **Lee Fraser** production manager of the corporation. Mr. Fraser formerly had been staff assistant to **W. C. McAllister**, vice-president-manufacturing. In this capacity he headed the firm's development of production lines to mass produce high precision instrument components.

Three vice-presidents have been elected to head 12 of the 31 divisions of the **Westinghouse Electric Corp.** They are **W. W. Sproul**, who will be in charge of the company's general industrial products group of divisions, **L. B. McCulley**, who will be in charge of East Pittsburgh divisions, and **H. E. Seim**, who will head the Sturtevant division and also The Bryant Electric Co., a wholly-owned Westinghouse subsidiary.

Among promotions in personnel to recently created positions announced by **Pivot Punch & Die Corp.** were **Roland P. Cercone**, formerly general manager, who has been named executive director of sales. **Edward H. Huntzinger**, who previously was chief engineer, was named works manager; and **George F. Edwards**, formerly office manager, was made secretary-controller of the firm.

Richard S. Huxtable, executive vice-president and general manager of **Fawick Airflex Co., Inc.**, has been elected a director of **National Tool Co.** Mr. Huxtable replaces **Fred V. Gardner**, senior partner of **Fred V. Gardner & Associates of Milwaukee**, who resigned because of demands of his own business.

OBITUARY

John A. Morrissey, president and founder of **Chicago Rivet & Machine Co.**, died recently at his home in River Forest, Ill. He was 58 years of age.

Coming Meetings

June 2-13, Canadian International Trade Fair. Exhibition Grounds, Toronto, Ontario.

June 9-21, triennial meeting of the **International Organization for Standardization**, Columbia University, New York City.

June 16-20, Industrial Finishing Exposition, sponsored by **American Electroplaters' Society**, International Amphitheatre, Chicago; to be held concurrently with AES annual convention, Conrad Hilton Hotel.

INDUSTRY'S
LEADERS —
SAY

Sentry
IN
HEAT TREATING
HIGH SPEED
STEEL



Sentry Model 3Y at Wetmore Reamer Company, Milwaukee, Wisconsin



WETMORE REAMER SAYS:

"More Life—More Production—Easier Operation"

So says **James E. Colburn**, Supt. of Heat Treat at **Wetmore**. He goes on: "Our Sentry 3Y runs at 2175° to 2360° 6 to 8 hours a day, five days a week. Our Sentry Diamond Blocks enjoy a long and useful life under these conditions. The rate of production and ease of operation are very pleasing."

REQUEST
CATALOG
WE-2

ALWAYS ON DUTY



SENTRY MODEL YP
Vertical model
for long, slender
drills, reamers,
broaches, etc.



SENTRY MODEL 2Y
For small tools,
cutters of moly,
tungsten and cobalt
high speed
steels.



THE SENTRY COMPANY

FOXBORO, MASSACHUSETTS

INDUSTRIAL ELECTRIC FURNACES AND EQUIPMENT FOR HEAT TREATMENT OF METALS

FOR FURTHER INFORMATION USE READER SERVICE CARD; INDICATE A-6-121

what did you use
today that was
machined with
WESSONMETAL?



AUTOMOBILE ?

**WASHING
MACHINE ?**



TRACTOR ?

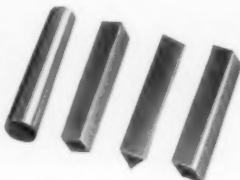


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INDICATE A-6-122-1

Good Reading

A GUIDE TO SIGNIFICANT
BOOKS AND PAMPHLETS
OF INTEREST TO TOOL
ENGINEERS

THE GRINDING WHEEL, by Kenneth B. Lewis. Published by The Grinding Wheel Institute, Greendale, Mass. 409 pp; price \$3.50.

The foreword for this volume states that it is designed for three types of audiences: the apprentices, students in technical schools and patrons of the public library; persons thoroughly acquainted with one phase of grinding but seeking a broad general knowledge of related fields; executives of various organizations with all degrees of relationship to the grinding industry.

For these audiences, the book is an admirable work and should serve the purpose for those who are interested in general background, for collected here is the best of present day information on grinding practices and abrasive technology. The book, however, cannot be recommended as a source of detailed information for specific problems. This kind of data has been collected and published by members of the institute or others in the field in much more exact and concise form.

INDUSTRIAL FURNACES, Vol. I, by W. Trinks. Published by John Wiley and Sons, Inc., New York. Fourth Edition. 526 pp; price, \$10.00.

Initially published in 1923, *Industrial Furnaces* has become one of the definitive publications in the field, and is regarded as one of the most thorough expositions of all phases and problems of practical technology. The book not only discusses the basic principles underlying all furnace design and operation, with numerous examples and illustrations, but also offers conclusions which have been tested and proved in actual practice.

The fourth edition brings this treatise up to date by incorporating the more recent scientific facts which have been discovered about heat transfer and furnace design as well as more modern design and operating techniques. The arrangement of the subject matter remains much the same as in the third edition, except that little used material has been moved to the appendix.

About 40 percent of the text has been rewritten and 94 new illustrations have been added. The tables have been brought up to date and many statements have been clarified. All calculations and tables have been converted from gross tons to net tons.

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INDICATE A-6-122-2

The Tool Engineer

Abstracts of Foreign Technical Literature

By M. Kronenberg

Great Britain: Several methods are available for calculating the number of teeth in gears which give a required ratio of transmission for a gear train or a close approximation. The so-called Lancaster Chart is often used to ascertain whether or not the numerator and denominator can be factorized to form the desired products of the number of teeth involved in the gear transmission. This chart also requires the calculation of a fraction with integer numerator and denominator.

R. A. Kraus has simplified this method, as described by him in the British edition of *Machinery* published April 10, by replacing continued and conjugate fractions in conjunction with a chart rendering it possible to identify numbers which may be expressed as the products of two numbers each being not greater than 100. The examples given in the article show that the inaccuracy is as low as 0.0001, a value which represents the deviation of the actual ratio of transmission from the theoretical ratio.

Production of hydraulic units such as jacks and cylinders calls for a considerable amount of machining to close tolerances and for high finishes on the working surfaces. However, for components required in large quantities, such as hydraulic props which are replacing timber in the British mining industry, the cost of fully machined assemblies would be prohibitive. According to an article published in the British edition of *Machinery* of April 3 by the Dowty Auto Units Ltd., advantage has been taken of the availability of close limit commercial mild steel tubing. By adopting this material as a basis for the design it has been possible to reduce the amount of necessary machining to a minimum and assembly is carried out almost entirely by brazing and arc-welding.

Tungsten, molybdenum and cobalt are scarce in Russia according to an article by N. H. Polakowski published in the British edition of *Machinery* of March 27. These materials are urgently needed in Russia for jet propulsion

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parts and for this reason the choice of high-speed tool steels has been reduced from five types to two types available to the Russian industry. One of them contains only $8\frac{1}{2}$ to 10 percent tungsten, $2\frac{1}{2}$ percent vanadium and 4 percent chromium, while the other type (which corresponds to our type 18-4-1) is restricted in use to hobs with ground profiles, shaping tools, thread milling cutters and the like.

On the other hand, and not quite consistent with the shortage in tungsten, it is indicated in the article that the Russians are using cemented carbide tools wherever possible and that most of these materials (which require as much as 95 percent tungsten) have been introduced since 1945, replacing the inferior tungsten carbides known as "Pobedit." Titanium carbide tools were developed as late as 1948. The article deals also with the use of negative rake lathe tools in Russia, with feeds and speeds for machining of hardened steel and of high nickel alloys. It is however not indicated in the article whether the substantial supply of tungsten available from Korea has been included in the above figures.

It has been evident to the gage making industry for some time past that the "B.S.I." and the "Newall" systems do not provide tolerances suitable for modern engineering practice and that 80 percent of plug gages are "specials" at present. F. W. M. Lee in an article in the British edition of *Machinery* published March 27 proposes adoption of a new system which he calls the "Pilot + 3" system. After justifying his proposition, the author discusses the various aspects of the problem such as the means for setting limits, the sources for errors in the machining of holes, the requirements of a tolerance system, the + 3 system, shaft, wear and gage tolerances and ways for introducing the new system.

At the annual meeting of the British Machine Tool Trades Association, Frederick H. Page expressed doubts whether industry at the present time was obtaining from universities and other training establishments the right kind of "human machine tools." According to a report in *Engineering* of March 28, he thought that students should be taking more subjects that will fit them for use in industry because the great field of experimental science is still there to be explored. Much could be achieved by applied technology in promoting a real industrial progress.

France: Cutting speed and feed data for groove milling operations are given in an article by R. C. Dale published in *La Machine Moderne* of April.

The Tool Engineer

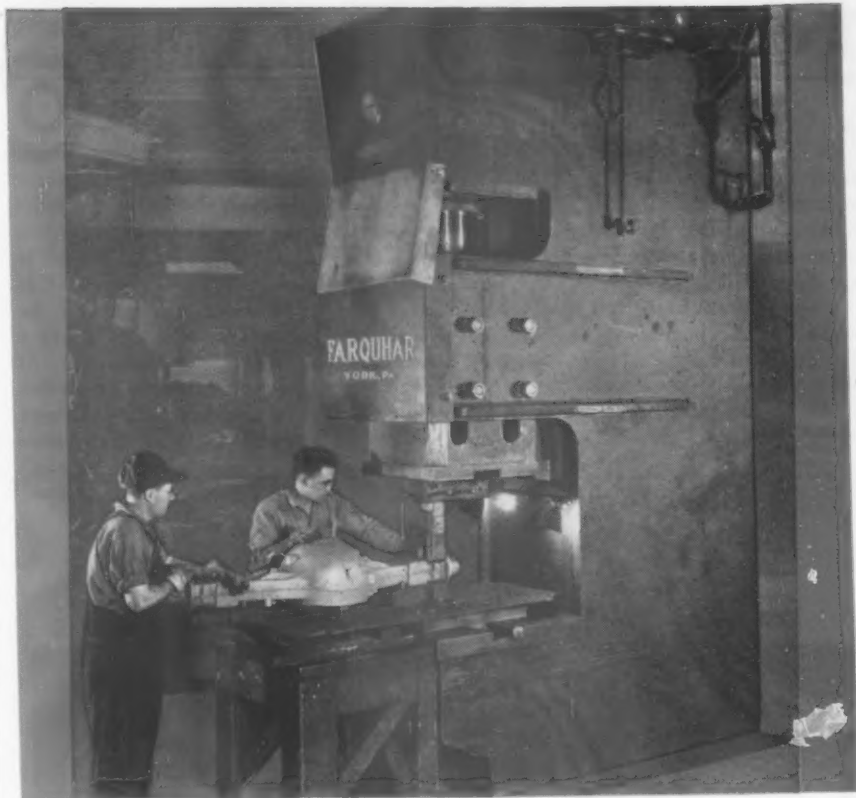
In the same edition an article by Henri Godfroid deals with French terms used in metallurgy which are also of interest to the English speaking countries because they permit translation of technical terms by implication and explanation. Various theories dealing with the effect of cutting fluids and with their practical application are discussed in *La Machine Moderne* of March by A. Niedzwiedzki. Indicating that his study should not be considered complete due to the complexities of the problems involved, the author brings out the different opinions and practices existing in this field of lubrication for the benefit of those who wish to draw their own conclusions rather than to depend on tradition in machine shops or on older publications. His article takes into consideration the purpose of lubrication, properties of cutting fluids, their classification, cutting oils, water emulsions, compressed air, selection of cutting fluids for turning and grinding, circulation and deep freezing.

Germany: Recent developments in the machining and measuring of interchangeable bevel gears are the topic of a publication by A. Raupp in the April issue of *Maschinenbau und Werkstattstechnik*.

New tools which may be termed "Christmas tree" cutters have been invented for the roughing of the space between the teeth, rendering it possible to reduce finishing to a single operation on a bevel gear shaper.

High accuracy and good surface finish can be obtained in the milling of bevel gears when using cutting speeds of about 200 ft/min taking a great number of cuts. The method proved to be very satisfactory because the cutting time per tooth did not exceed 5 to 40 seconds. A satisfactory grinding machine for bevel gears, however, is, in the author's opinion, not yet on the market.

A mathematical investigation of the forces required for forging the noses of artillery shells appeared in *Maschinenbau und Werkstattstechnik* of April. The author, G. Sonntag, indicates that his theories are based on similar derivations by A. Naday in USA which, however, have been expanded by him to include the non-uniform heat pattern in the shell and the working of the material. The two main topics of this dissertation refer to the determination of the forging forces and to the conditions which permit elimination of the bulging of the shell. These problems depend on the shape of the shell, on friction, forging speed and heat treatment. Numerous formulas and diagrams complete the discussion.



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Technical Shorts . .

AN ASSISTANCE program regarding metal finishing and coating problems confronting industries producing or working with metal products, has been set up as a special service of the Porcelain Enamel Institute.

A special committee has been established for the purpose of researching new applications for porcelain enamel and to provide the consulting, technical or developmental assistance any metal product producer may need in testing

porcelain enamel as his product finish.

The service of the committee (which is available without charge) provides an opportunity to obtain counsel regarding the applicability of porcelain enamel to specific finishing problems, as well as specialized information regarding design and metal fabrication to adapt a product to this type of finishing. At the same time it is equipped to furnish technical assistance concerning the type required for various kinds of services

such as resistance to high temperatures, corrosive influences, abrasion etc., and other problems.

Address New Uses Committee, Porcelain Enamel Institute, 1010 Vermont Ave., N. W., Washington 5, D. C.

THREE CHARTS, which offer a rapid convenient method of indexing X-ray diffraction patterns to determine crystal structure for lattice parameter calculation, have been published by Armour Research Foundation of Illinois Institute of Technology.

Data for the charts were calculated and plotted by Robert E. Riley, assistant metallurgist, and William Rostoker, research metallurgist, and are based on charts originally constructed by W. P. Davey and A. W. Hull, appearing in the book *Study of Crystal Structure and Its Applications*. Covering cubic, tetragonal and hexagonal systems, the Foundation's charts eliminate considerable calculations. The first has been plotted up to twelfth order reflections, while the latter two have been plotted up to sixth order reflections with axial ratios ranging from zero to 2.6.

Available from Metals Research department of the Foundation, 35 W. 33rd St., Chicago 16. \$5.

ALTHOUGH UP to the present time copper has been the traditional electric conductor because of the low resistance it offers to electric current, the competing uses found for it during the past few decades have brought about a scarcity of the metal and a considerable rise in its cost. As a result, the trend is toward using aluminum instead of copper as an electric power conductor, according to E. V. Sayles and C. E. Topping of Consumers Power Company, Jackson, Mich. The report was made during the recent American Power Conference.

Aluminum, although lower in conductivity and strength than copper, is very abundant, the speakers pointed out. "Lack of conductivity can be overcome by use of more metal," they said, "and mechanical strength can be secured by stranding aluminum with metals of greater strength."

Until recently it was advisable to use aluminum mainly in high voltage transmission lines. This was because fewer connections between copper and aluminum conductors were required in such lines, and the properties of these elements made it difficult to connect them without causing deterioration of the aluminum. Now development of suitable connecting devices has made it practical to use aluminum in the vast low voltage distribution systems as well, the engineers said.

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A GUIDE for designers, inspectors and specification writers concerned with designating the type of surface desired on industrial products, particularly those with machined surfaces, has been approved by the American Standards Association. Designated B46.2-1952, it is the American Standard for Physical Specimens of Surface Roughness and Lay.

Two types of physical specimens described in the standard include one for general purpose specimen blocks and one for precision reference work. The first type represents typical machined flat surfaces as actually produced in the shop, while the second represents work such as checking the calibration of surface as produced in the shop by actual machining operations.

For general purpose blocks, the standard contains a table listing for various types of finishes, a range of roughness heights in microinches, lay and roughness width in inches.

Specifications for precision reference specimens refer to surface contour material, accuracy, uniformity and rating. This standard is a companion document to the American Standard Surface Roughness, Waviness and Lay, B46.1-1947.

NOT JUST the housewife who "cooks from a can" but many people in industry, including steel producers, will be interested in the study of how long a tin can will last. The research, conducted by Armour Research Foundation of Illinois Institute of Technology for Inland Steel Co., indicates that it may soon be possible to make tin cans with a definitely predictable life span, and at the same time produce one requiring less of the highly critical tin. Actually the cans are steel coated with a very thin layer of tin; although heavier coatings of tin inside the can may keep the foods from "eating through" to the base metal, the tin will eventually be corroded away by the contents of the can, then juices will be in direct contact with the steel base which corrodes more rapidly than tin.

The scientists are seeking a base metal which will corrode at a low rate after juices get through the tin. "Pickle lag," the tendency to corrode at a very slow rate, is the characteristic being sought in the various specimens of steel, and an instrument has been developed which detects immediately if a steel sample has this quality, and also determines the precise rate at which it will corrode. When the experiment is completed, packers will be able to predict the exact shelf life of a given can of food by adding the life of the tin coating to the time the steel will be safe.

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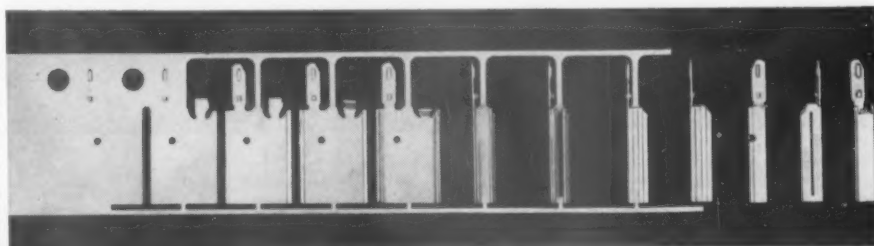
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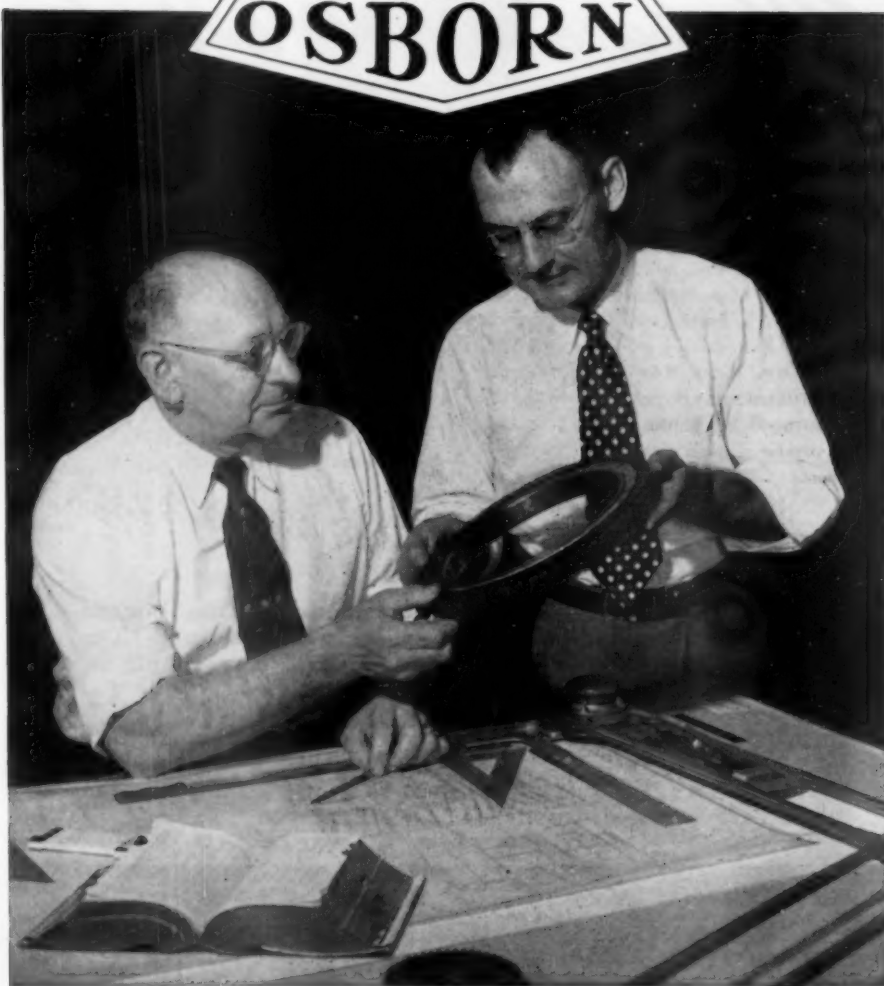
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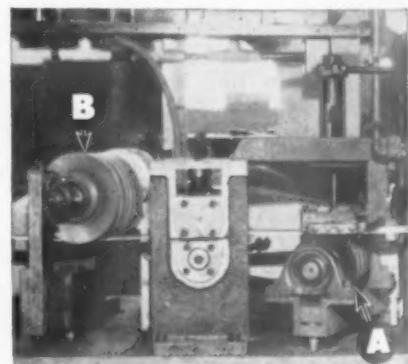
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TINY BUT TOUGH. Drilling of this nickel-size stainless steel part of an aircraft engine left burrs around the edges which were difficult to remove. The **Osborn Brushing Analyst** helped solve the problem by using Osborn brass wire brushes and an abrasive compound with the right amount of grit. Now burrs come off clean and sharp corners of holes are well rounded . . . *at the push of a button.*



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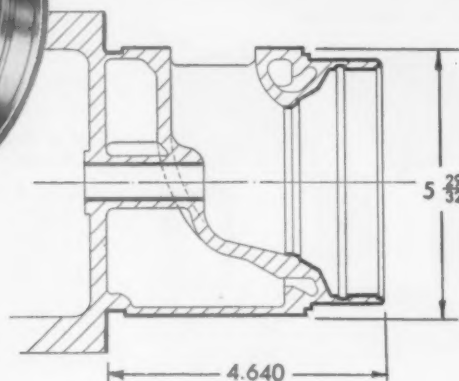


IT'S AUTOMATIC. This machine, developed with the help of the **Osborn Brushing Analyst**, cleans steel-backed, babbitt-lined strip for production of automotive sleeve bearings. With the strip traveling continuously, Osborn Master Wheel Brushes (A) remove all dirt, rust and metal particles from the steel surface. Osborn Monarch Sections (B) then thoroughly clean the babbitt side. Perhaps a similar brushing method can help improve your production . . . *at the push of a button.*

ALL
THIS

RAPIDLY
PROFITABLY
AUTOMATICALLY

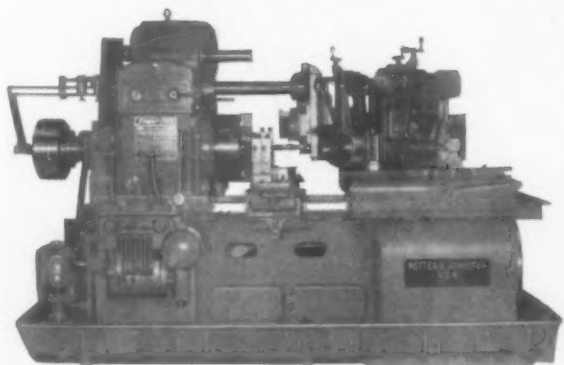
WITH A



Heavy lines indicate machined surfaces on cast iron cylinder head

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DIES

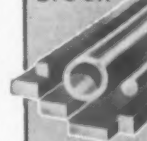


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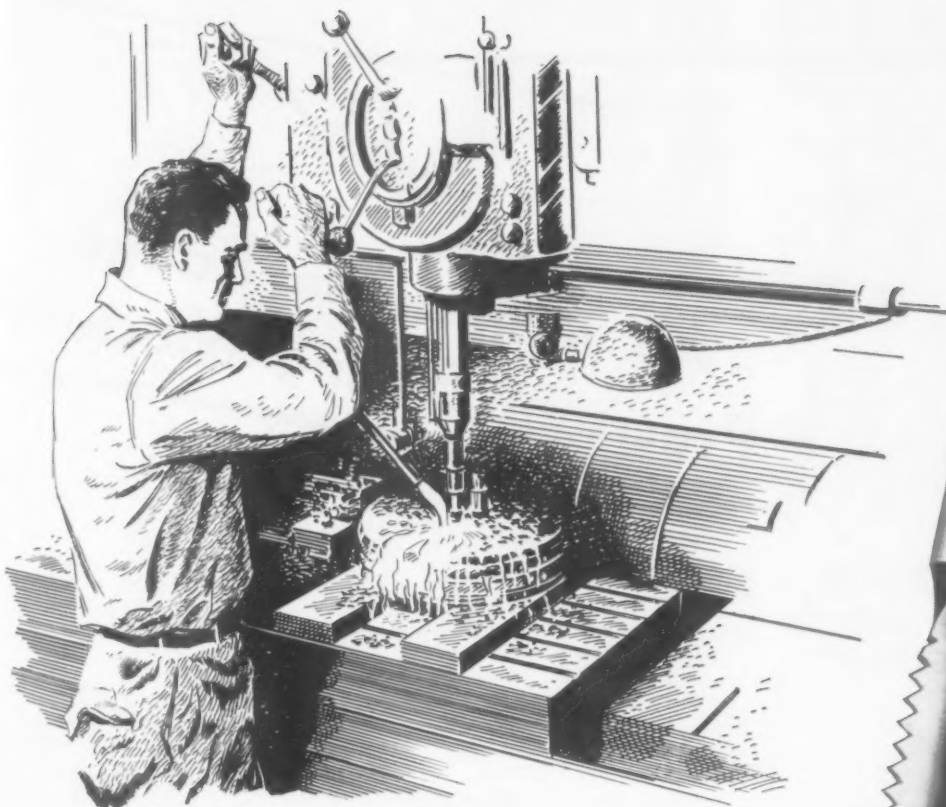
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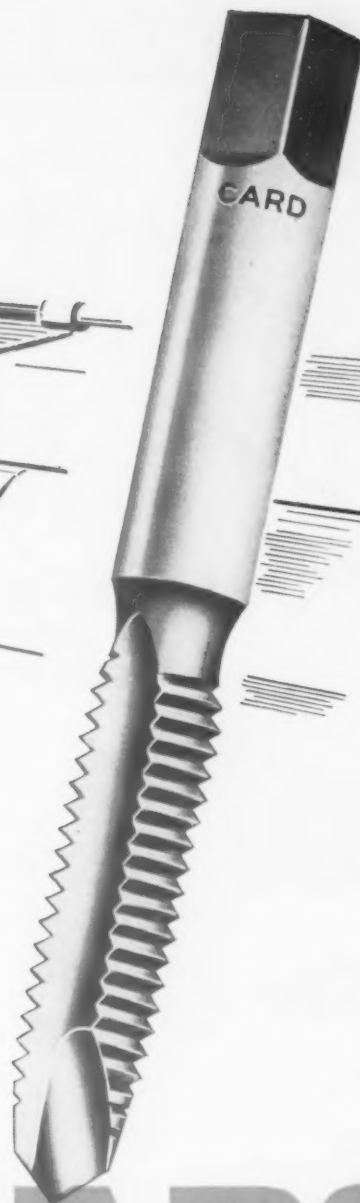


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OR
SHORT



In order to facilitate the simultaneous precision boring and facing of both ends of various sizes and lengths of steel tubing at one time a manufacturer selected the **SIMPLEX 2U Double End Precision Boring Machine** shown above. The machine is equipped with two No. 4 **SIMPLEX Precision Boring Heads** and a variable speed drive to the spindles to accommodate necessary spindle speed changes. The bed of the machine is so constructed that accurately located fixtures equipped with interchangeable work-holding jaws can accommodate tubes varying from 1½" to 6" O.D. and from 17" to 96" in length.

Simplex

PRECISION BORING MACHINES

SIMPLEX MACHINE TOOL DIVISION

STOKERUNIT CORPORATION
4528 WEST MITCHELL STREET

MILWAUKEE 46, WISCONSIN

• PRECISION BORING MACHINES

• PLANER TYPE MILLING MACHINES

• SPECIAL MACHINE TOOLS



STOPS production hold-ups

INTERRUPTED production and delays run up costs in the machine shop. Red Shield Drills, Reamers and other metal cutting tools give uninterrupted production because of their Foremost Quality.

Standardize and reduce costs by specifying *Standard* Drills, Reamers, Taps, Dies, Milling Cutters, End Mills, Counterbores and Hobs.

You can count on prompt service from Standard Tool Distributors from coast to coast.



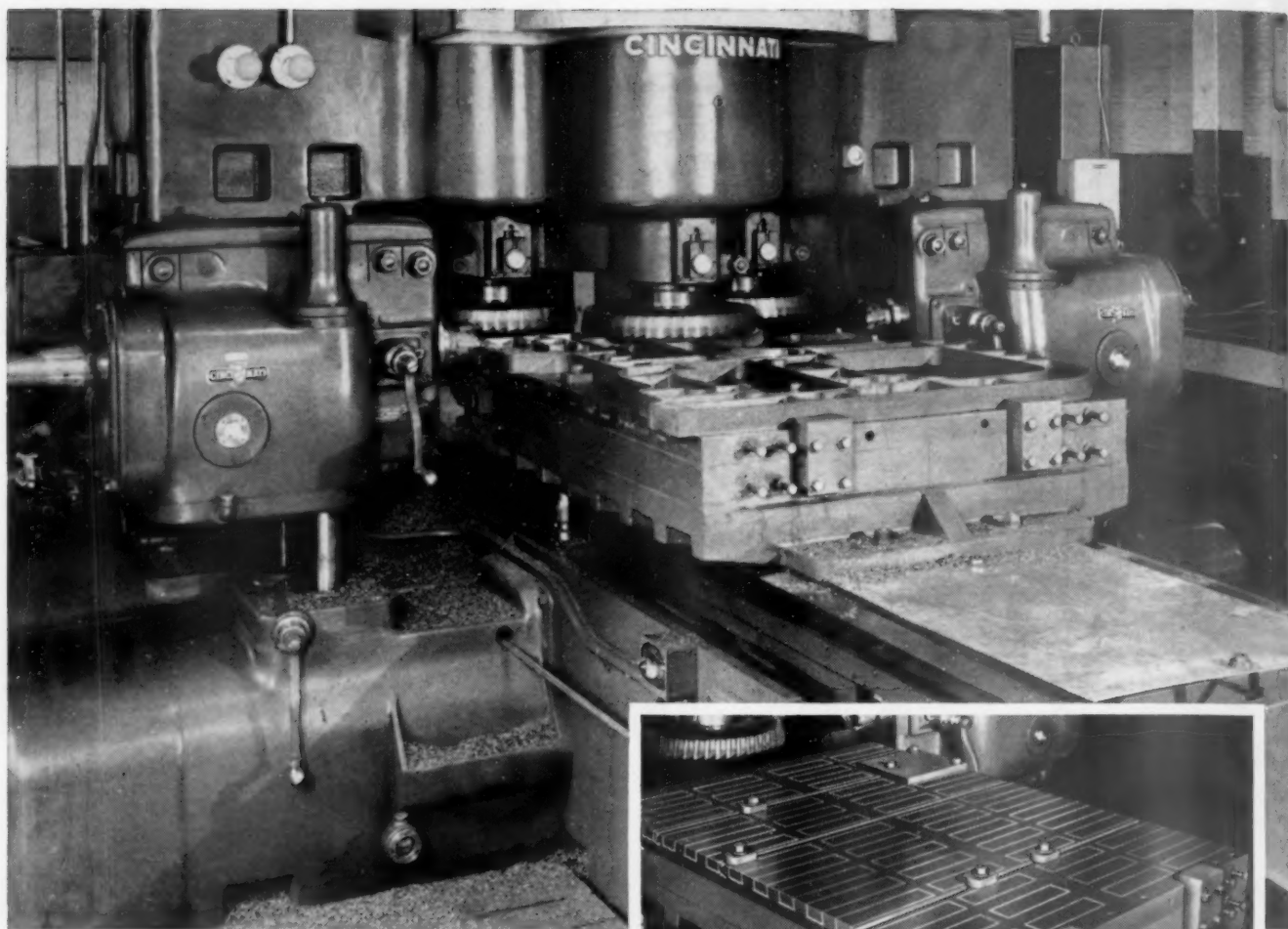
STANDARD TOOL Co.

DEPT. 13-F, 3950 CHESTER AVENUE
CLEVELAND 14, OHIO

New York • Detroit • Chicago • San Francisco



STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS.
THERE IS A STANDARD DISTRIBUTOR NEAR YOU AND READY TO SERVE YOU.



This TAFT-PEIRCE MAGNETIC CHUCK

*takes a $\frac{1}{4}$ " Cut
at 30" per minute*

Here's a 55½" x 40" Superpower Magnetic Chuck that holds several different designs and sizes of cast iron Loomsides flat within .002" . . . on a special 75 HP milling machine. With a table feed of 30" per minute, three 18" carbide milling cutters and two 4" face mills take cuts from $\frac{1}{8}$ " to $\frac{1}{4}$ " in one pass.

Many people said it couldn't be done without the aid of auxiliary face plates. But

Built for Crompton & Knowles Loom Works. Note T-slots to permit instant positioning. Pole pieces extend to extreme edges for greater working surface. Lines of force are so concentrated in work that machine and cutters are not magnetized.


the special T-slot design plus the same extra holding power . . . more efficient design that go into all T-P Superpower Magnetic Chucks made this installation possible.

When you need a magnetic chuck — standard or custom-made — be sure to specify a Taft-Peirce Superpower Magnetic Chuck. Write for our Magnetic Chuck Bulletin 410.

THE TAFT-PEIRCE MANUFACTURING COMPANY
Woonsocket, R. I. — Branch offices in all principal cities



T-P means Top Precision



fine Jessop
steel is most
carefully
watched

There is more than skillful melting and working and treating behind Jessop's reputation for the finest specialty steels. Each batch is subjected to rigid quality control at all stages, to assure precise formula and condition. When you buy from Jessop, you buy more than good steel. You acquire metal that is custom-made to your specific need.

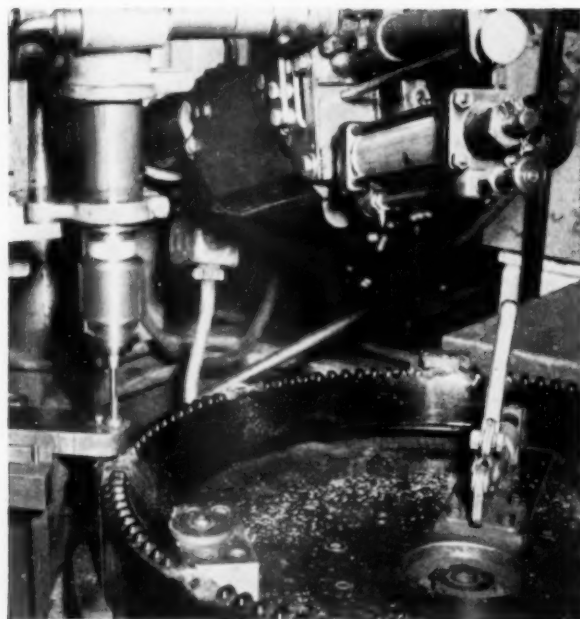
HIGH SPEED STEELS • HIGH SPEED BITS • PRECISION
GROUND FLAT STOCK • HIGH SPEED AND ALLOY SAW
STEELS • HOT WORK DIE STEELS • COLD WORK
DIE STEELS • CARBON AND ALLOY STEELS •
STAINLESS AND HEAT RESISTING STEELS • VALVE
STEELS • STAINLESS-CLAD STEELS • CAST-TO-SHAPE
STEELS • COMPOSITE TOOL STEELS • ARMOR PLATE

JESSOP

STEEL COMPANY • WASHINGTON, PENNSYLVANIA



HOTPOINT, INC., MAKE IMPORTANT SAVINGS In "Controlled-Air-Power" Drilling & Tapping Operations



If you'd like a copy of the Foto Facts File describing this operation at HOTPOINT, INC., write The Bellows Co., Dept. TE-652, Akron 9, Ohio. Ask for Foto Facts File FF-51-622.

Cuts labor cost from 33-6/10c to 7-3/10c each in drilling and tapping a heavy cast iron ring

THE makers of the famous HOTPOINT appliances watch costs as carefully as they guard quality. They pay particular attention to "second operation machining" for here they know substantial cost savings can be made.

Tool room ingenuity, coupled with Bellows "Controlled-Air-Power" Devices, have paid big dividends at HOTPOINT. Take, for instance, the set-up shown above. This special machine, built in their own tool room, combines two standard drill press heads, two Bellows electrically controlled drill press feeds and an electrically controlled Bellows Rotary Feed Table. It cut labor costs in drilling and tapping 8-1/4" holes in a 25# cast iron ring more than 70%.

The story is typical of the experiences of thousands of manufacturers, large and small, in all lines of industry. No matter what you make, chances are Bellows "Controlled-Air-Power" Devices can help you make it quicker — at at less cost.

The Bellows Co.

AKRON, OHIO

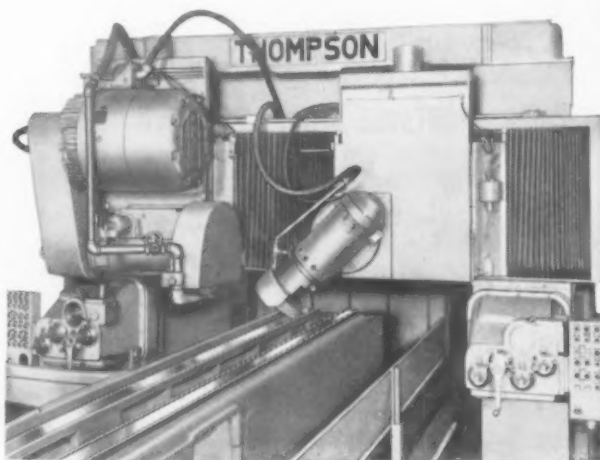
1387

New Thompson Way Grinder Developments

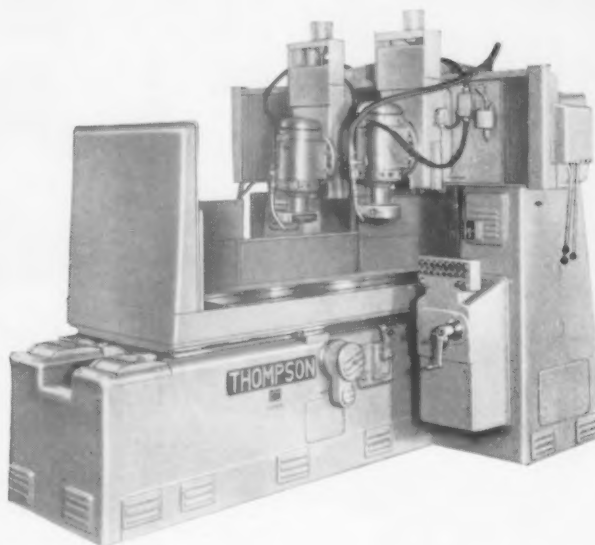
Reduce Costs ... Speed Machine Tool Production

Way Grinders now available with single, multiple heads, or combinations of horizontal and vertical heads and in sizes to meet all requirements.

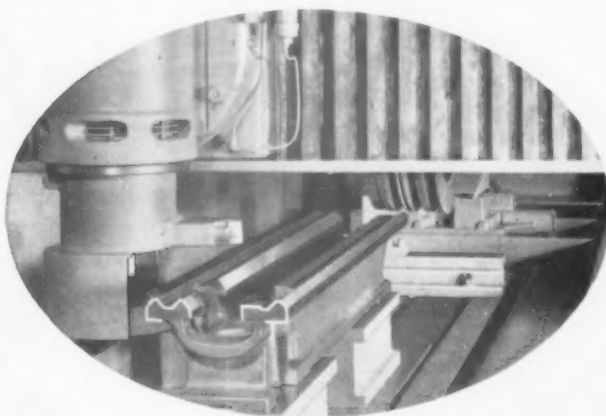
Thompson has produced machine tool way grinders in many types and sizes that have eliminated hand-work and produced economical and accurate ground ways. However, recently increased production grinding of ways has been made possible by many new Thompson Way grinding developments such as: automatic grinding and truing cycles; dual vertical or horizontal heads for grinding ways different heights; horizontal multi-wheel grinding and vertical side and undercutting head; Hydrail way grinding for giant columns or bed ways. Three of the new Thompson Way Grinders are shown here.



Designed especially for extremely large machine tool way grinding is this typical Thompson Hydrail Way Grinder. Size 48" x 48" x 192". Part: grinder bed ways.



One of several new Thompson Double Head Dove-tail Way Grinders installed to speed work and hold accuracy in the plant of a leading lathe manufacturer.



Multi-wheel grinding with auxiliary vertical head. Equipped with horizontal spindle having dual spaced wheels and auxiliary inclinable spindle. The front contoured grinding wheel grinds the rear set of ways and the rear grinding wheel grinds the front set, with vertical head grinding the sides and undersurface of the ways and rack seat.

Write for details Today.

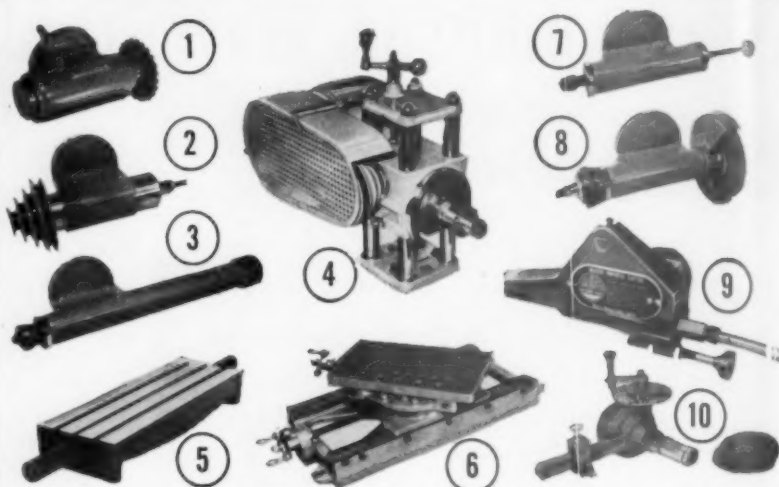
Thompson
SURFACE
Grinders

The Thompson Grinder Company, Springfield, Ohio

Copyright 1952—The Thompson Grinder Co.

master MACHINE TOOL ATTACHMENTS

for
**LATHES
TURRETS
MILLS**
OR USE INDEPENDENTLY



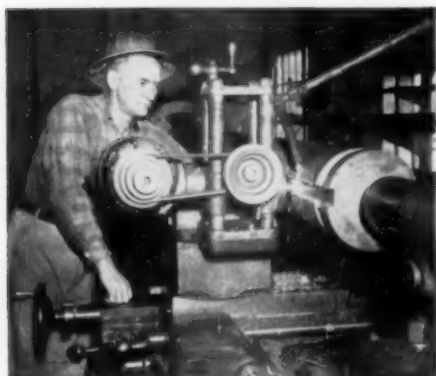
- | | |
|---------------------------------------|---------------------------------|
| 1. 90° Universal Milling Head | 6. Universal Feed Table |
| 2. Hi-Speed Milling and Drilling Head | 7. Internal Grinder Head |
| 3. Deep-Hole Internal Grinder Head | 8. External Grinder Head |
| 4. Basic Milling Unit | 9. Slotting and Keyseating Head |
| 5. Milling and Grinding Table | 10. Geared Dividing Head |

THREE SIZES

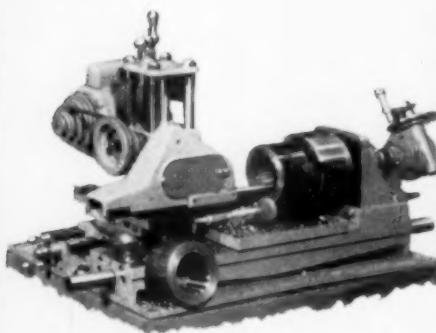
MODEL "C," ½ hp — 9" TO 13" LATHES
MODEL "B," ½ OR ¾ hp — 13" TO 18" LATHES
MODEL "M," 1 OR 1½ hp — 18" TO 72" LATHES

The Master attachment can be used profitably on many production operations. Mount it on your present equipment, lathes, turrets, mills, or use independently to perform additional operations in the same set-up. The basic milling unit with the above types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating, both internal and external. Therefore, the Master with its full complement of equipment is an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. These improved models of Master attachments are outstanding in rigidity, capacity, and simplicity of set-up and operation and incorporate the latest features developed in our seventeen years of manufacturing this tool. Investigate this valuable shop tool. For the cost of one single-purpose machine, you can have several Master units producing. Prompt deliveries.

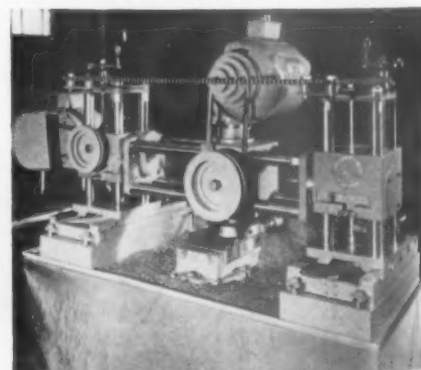
MAKES LOW-COST INDEPENDENT PRODUCTION SET-UPS—PORTABLE — SELF-POWERED



End Milling 2½" keyway in 9¾" diameter shaft
22 ft. long



Master portable key seating and slotting head cutting
internal splines on bench set-up



Special portable milling machine made from standard
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universal head



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FIXTURES

the Key to Broaching Speed and Economy

Because the fixtures so often determine the speed and economy of broaching operations, it is just "good business" to entrust their design to specialists of proven experience and ability in the broaching field. Manufacturers, high production and job lot, depend on Red Ring broach engineers to develop their tooling.

Illustrated here are some of the fixtures used to produce the reverse brake band anchor, an element of a modern automotive torque converter. Of the 7 machining operations on this part, 5 are broaching.

Ask Red Ring broach engineers for suggestions on your tooling.



NATIONAL BROACH & MACHINE CO.

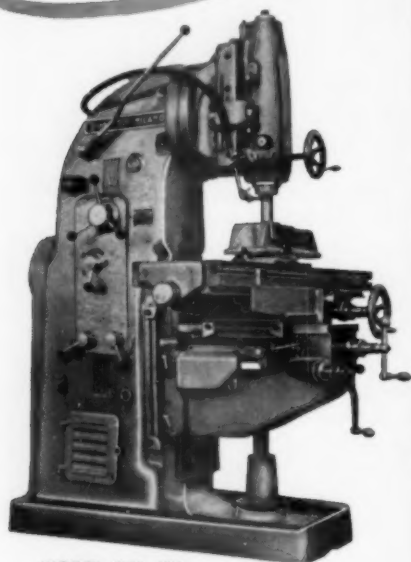
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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

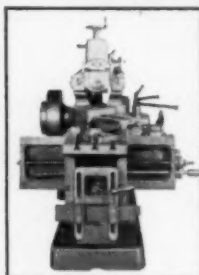
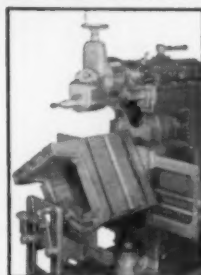
BOOST YOUR PRODUCTION

... Reduce costs with

AVAILABLE NOW
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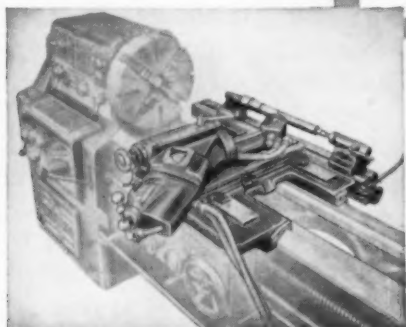
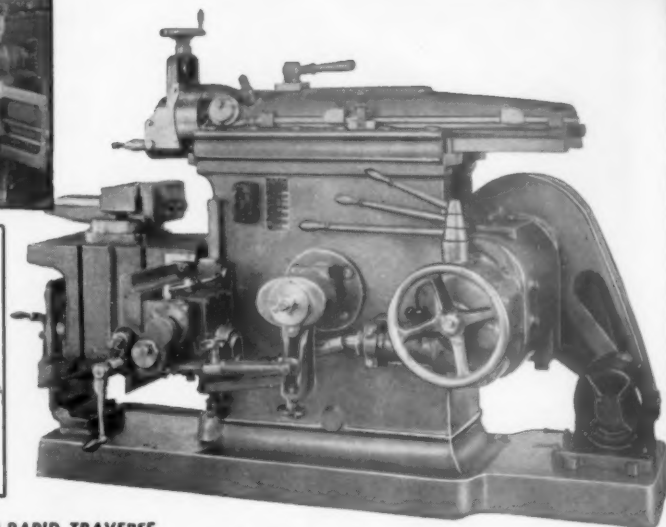
**MODEL A.V. 3N
VERTICAL MILLING MACHINE**
Built for endurance and high speed production! Table surface 57" x 14"; 12 spindle speeds, range 16-1000 RPM.



GEARED SUPER-RAPID TRAVERSE

SHAPERS

Rugged, smoothly operating machines in five different models for various work requirements. Ram operated on adjustable V-slides. Available with 360° automatic rotating table. Can be supplied up to 48" stroke.

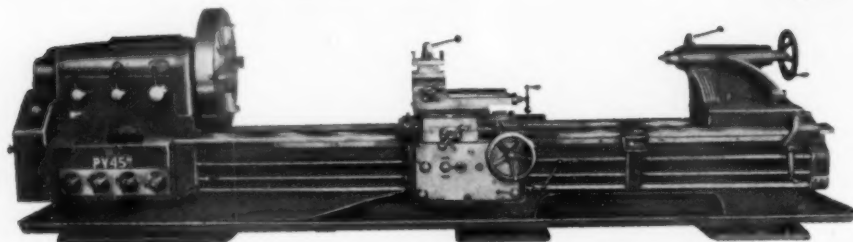
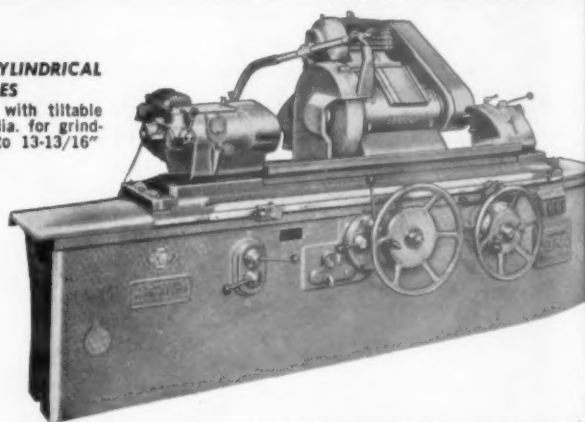


Engine Lathes with "DIPLOMATIC" HYDRAULIC COPYING ATTACHMENT

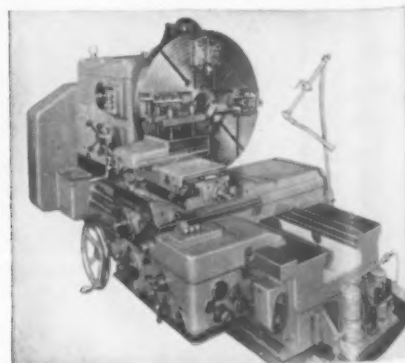
All DIMCO lathes can be supplied with this modern device which exactly traces duplicate parts from template in any quantity large or small. Reduces set-up time to minutes—eliminates rejects.

DIMCO "BERCO" CYLINDRICAL GRINDING MACHINES

Model RTK 180/1000 with tiltable or fixed table. Max. dia. for grinding with new wheel to 13-13/16"



MODEL PV-45 FULLY GEARED HEAVY DUTY ENGINE LATHE
Swing over bed 35"; Distance between centers 79"; bed width 23 3/4"; 18 spindle speeds; range 6 to 412 or 7 to 500 R.P.M. 15 HP motor.



UNIVERSAL FACING LATHE

Distance between centers 49" to 228"; Height of center 25 1/2"; spindle hole 3 1/4"; Max. turning dia. over bed 51-3/16"; 15 to 50 HP motor; 18 spindle speeds; range 2 to 200 RPM. Absolute rigidity eliminates all vibration!

Write, wire or phone us for detailed information on these machine tools as well as the complete DIMCO line!

**KELVIN SYSTEMS
CORPORATION**
IMPORTERS OF MACHINE TOOLS



SHOWROOMS

53 WATER STREET
SOUTH NORWALK, CONN.

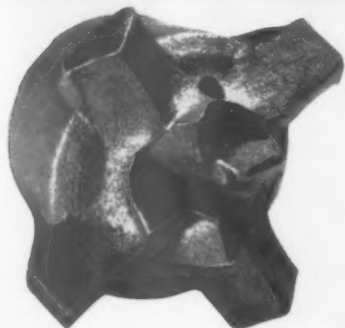
MAIN OFFICE: 135 FRONT ST., NEW YORK 5, N.Y.

Tool Steel Topics



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation, Export Distributor; Bethlehem Steel Export Corporation.



25,000 Rock Bits Forged Daily by Punches and Dies of Cr-Mo-W

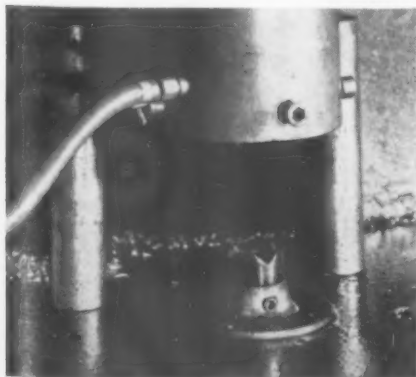
The hot-forging and trimming of steel bits for drilling rock is a pretty tough job for a tool steel. After trying several different kinds of hot-work steels, Western Rock Bit Manufacturing Co., Salt Lake City, found that our Cr-Mo-W produced more bits than more expensive and higher-alloy hot-work steels.

In the initial operation in the making of the bits, a punch of Cr-Mo-W extrudes a hot steel slug (1950 F) in a 400-ton press. In subsequent steps, the bits are trimmed to exact size by trimming dollies and water holes are pierced by punches also made of Cr-Mo-W.

This is an all-around hot-work steel containing 5 pct chromium. It's especially suited for jobs that involve shock, drastic temperature changes, and for all applications where heat-checking is a problem.

Cr-Mo-W hardens in air and has good resistance to distortion during heat-treatment. It's an easy steel to machine because it can be annealed to 217 Brinell.

Like to know more about Cr-Mo-W? Write us for Booklet 265, giving details on all of our hot-work steels. Address your request to Publications Dept., Room 1041, Bethlehem, Pa.



Bits are trimmed to exact size by the trim dolly shown above. Made of Cr-Mo-W hot-work steel, its service life is about 30,000 bits.



Ultrasonic inspection of the entire length of this tool steel bar aids in detecting injurious internal defects.

What We Mean by "Ultrasonic-Tested" Steel

Sometimes we are asked to explain the phrase "ultrasonic-tested" which appears at the bottom of our tool-steel advertisements. Well, this refers to one of the standard tests we use to safeguard the quality of tool-steel billets and large bars.

An ingenious piece of electronic equipment, known as a reflectoscope, generates millions of vibrations per second and beams these ultrasonic waves through the steel. The echo or reflection from the opposite surface of the steel appears as a wave pattern on the oscilloscope screen of the instrument so that the entire section is thoroughly probed for deviations from high quality.

Expert operators watch the screen and

interpret the "pips" or wave patterns that appear as the entire length of the bar or billet is inspected. Any injurious internal condition that may exist is easily recognized.

Some people are dubious of such non-destructive testing methods. So were we when we first experimented with this equipment. That's why we've sliced up hundreds of bars and billets to make sure that the ultrasonic testing was giving us a reliable picture of the internal structure of our tool steels.

It's just one of many steps in our constant effort to avoid shipping even one bar of tool steel that's not every bit as sound as the customer expects it to be.



Our Tool Steel Engineer Says:

Polished tool surfaces give longer service

Tool surfaces which are polished create less frictional heat and are less likely to gall or "pick-up." These considerations are especially important when tool surfaces have a moving contact with metals and are subject to high pressures.

On cutting tools, for example, the flow of chips across the face of the tool creates far less friction when the grinding marks are parallel to the chip movement or when grinding marks are largely

eliminated by polishing. Some twist drills and taps now have polished flutes, a feature intended to extend tool life.

It's often costly and time-consuming to polish tool wearing surfaces. But longer tool life can often make it well worthwhile.

The usual polishing procedure is to grind with a 60-grit abrasive, followed by polishing successively with 120-grit and 320-grit abrasive powder.

Bethlehem



Tool Steel



Time to Replace Worn Bushings!

Worn bushings break drills, ruin parts and often cause expensive inaccuracies. New bushings are so inexpensive in comparison. And be sure you get the best—ACE. Best from every standpoint—quality, accuracy and availability. Order your new, free ACE catalog today.

Ask for Catalog 1101-2

ACE DRILL BUSHING CO., INC

5407 Fountain Ave.
Los Angeles 29



USE READER SERVICE CARD; INDICATE A-6-142-1

There's a Walker Magnetic Chuck for Every Known Application . . .



For sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic clutches.

Original Designers and Builders of Magnetic Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

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142

MICROFLAT

BLACK GRANITE SURFACE PLATES

Present an absolute continuous bearing surface, finished up to 50 millionths inch. Incredibly smooth. Falling objects do not cause humps. Being harder than hardened steel, can take greatest mistreatment without causing inaccuracy of surface. No oiling. Will not rust or warp. No re-scraping or frequent re-finishing. Can use for spotting and "bluing in."

Immediate delivery in most sizes from 9x12 to 48x144. Request Bulletin and name of Distributor nearest you.



COLLINS MICROFLAT CO.

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Fellows

MACHINES and TOOLS

FOR CUTTING

. . . SHAVING

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AND INSPECTION

in GEAR PRODUCTION

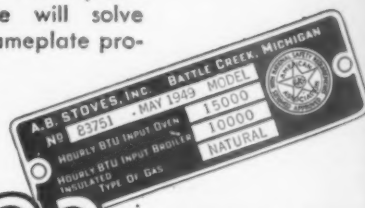


THE FELLOWS GEAR SHAPER COMPANY, SPRINGFIELD, VERMONT

USE READER SERVICE CARD; INDICATE A-6-142-4

FAST, CLEAN Panel Marking

Matthews "222" Nameplate Marking Machine will solve your needs for nameplate production marking.



These compact, safe operating nameplate marking machines can be furnished either pneumatic, hydraulic or hand operated . . . they can't be beat for marking of neat, attractive and perfectly aligned characters or symbols in your blank nameplate panels. Write today for Bulletin B-6.

JAS. H. MATTHEWS & CO.

3923 FORBES ST. • PITTSBURGH 13, PA.

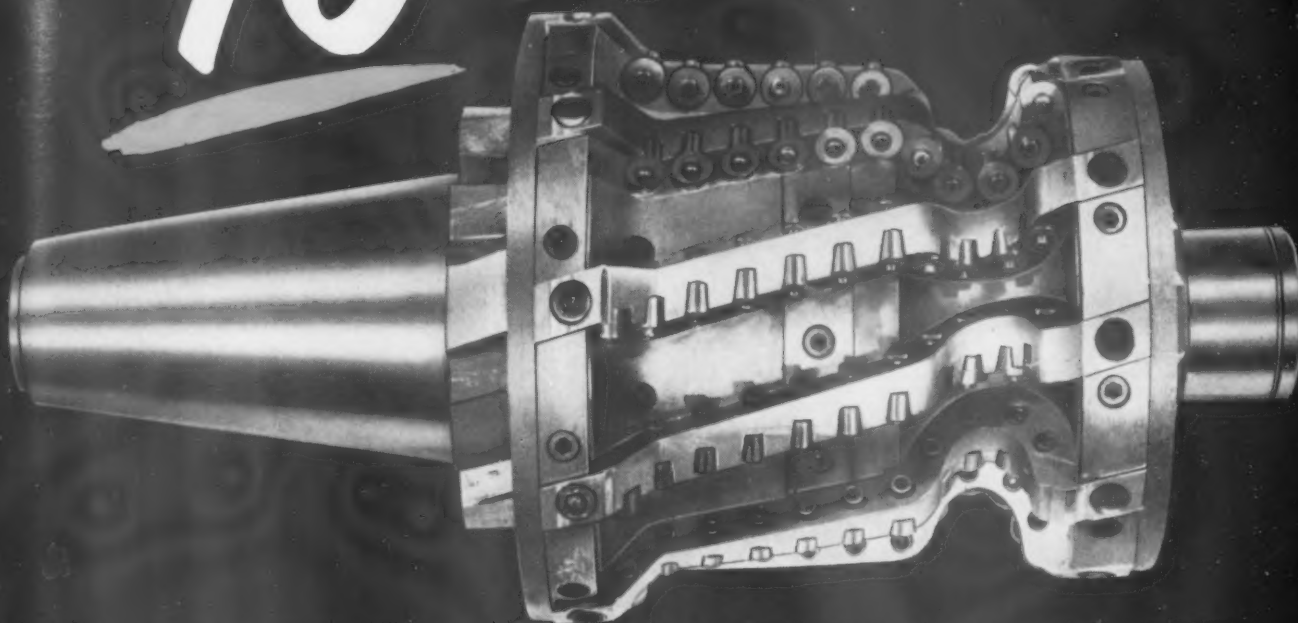
NEW YORK • BOSTON • PHILADELPHIA
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USE READER SERVICE CARD; INDICATE A-6-142-5

The Tool Engineer

THIS CUTTER HAS

16 LIVES!



ANOTHER ILLINOIS TOOL WORKS ASSIST IN DEVELOPING COST SAVING TOOLS

An ingenious new machine developed by the Standard Railway Equipment Manufacturing Company of Chicago made locomotive wheel truing operations much faster and less costly. But cutters wouldn't hold up—the wheels themselves were work hardened by thousands of miles of service to more than 500 Brinnell!

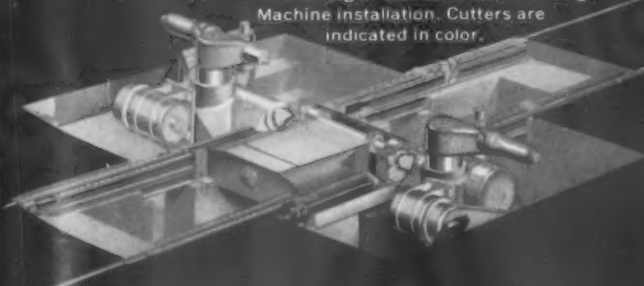
After experimentation, Standard Railway engineers brought their ideas to Illinois Tool Works, "Headquarters for Engineered Cutting Tools." Cooperative development work produced the special form cutter shown here—and a unique new principle that permitted amazing tool maintenance economy.

Removable carbide inserts can be repositioned 16 times before replacement of the inserts is necessary.

Illinois Tool Works engineers are at your service to help you solve your own specific tooling problems . . . write today.



Drawing of Standard Wheel Truing Machine installation. Cutters are indicated in color.



"Headquarters for Engineered Cutting Tools"

ILLINOIS

TOOL WORKS

2501 North Keeler Avenue
Chicago 39, Illinois

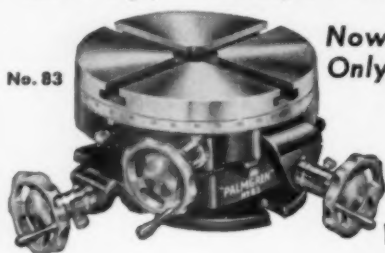


DUAL CROSS and ROTARY FEED

PALMGREN

Rotary, Index, Milling Table

No. 83



Now \$54⁵⁰
Only

Turns Your
DRILL PRESS
Into A
VERTICAL MILLER

Think what this will mean in your shop! Can be used on any Drill Press, Lathe or Milling Machine and provides what is practically a universal milling machine.

Designed for use in all types of metal and woodworking shops. A precision table permitting fine work to close tolerances. It is accurate, speedy, well constructed and attaches quickly in a firm position.

Rotary feed calibrated in degrees; Cross feed in thousandths; Dual Cross Slide with cross feed $2\frac{1}{4}$ " each side of center or $4\frac{1}{2}$ " overall. Has acme thread cross feed screws, adjustable gibs on cross slides. 40 to 1 worm and gear ratio in rotary feed. Equipped with bolt slots and locking screws.

No. 83 Table Dia. 8", T-Slots $\frac{3}{8}$ ", Base Keyway $\frac{3}{8}$ ", Base Dia. $6\frac{1}{4}$ ", Ht. 5", Wt. 37 lbs. Price Only \$54.50. Other Types available, No. 82 Dual Cross Feed only \$43.75; No. 86 Rotary Feed Only \$46.75.

Order Today! If dealer can't supply, write us. Ask for Circular No. 10

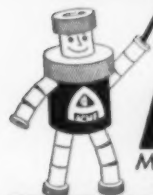
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Mfrs. of PALMGREN PRODUCTS Since 1918

8391 South Chicago Ave.

Chicago 17, Ill.

USE READER SERVICE CARD; INDICATE A-6-144-1



To maintain maximum accuracy in drilling operations, use the bushing that's precision made for the job...use Acme. Write for catalog.

Acme Industrial Company

Makers of Hardened and Ground Precision Parts
208 N. Laflin Street • Chicago 7, Illinois

THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

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FOR OVER 50 YEARS
MOLINE "Hole-Hog"
SPECIALLY DESIGNED
MACHINE TOOLS
HAVE CUT PRODUCTION COSTS
FOR AMERICAN INDUSTRY



DRILLING
BORING
HONING
TAPPING and
Special Machines



USE READER SERVICE CARD; INDICATE A-6-144-3



LOOK TO WHO

For the finest
COUPLING BOLTS
MILLED STUDS
CAP SCREWS
SET SCREWS

*WHO is... **W.M.H. Ottemiller Co.** YORK, PA.
Write for name of nearest distributor and our free illustrated folder.

USE READER SERVICE CARD; INDICATE A-6-144-4

Better RESULTS IN TAPPING AND REAMING

It is a generally accepted fact that the perfection of tapping and reaming work depends to a great extent upon the type of tool holder used.

Take the Ziegler Holder, for example. Its ability to compensate automatically for inaccuracies in the set-up enables it to turn out work to the finest of tolerances in spite of faulty alignment of the work with the spindle.

You'll find that it always floats freely, without friction or cramping, even under the severest tool-driving strains and takes any and all end-thrusts. Try it out and see how much better work it will enable your machines to perform.



W. M. ZIEGLER TOOL COMPANY
13574 Auburn Detroit 23, Mich.



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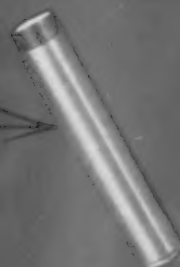
FLOATING HOLDER

for Taps and Reamers...

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The Tool Engineer

A Good, Fast Start for Your Tooling Program



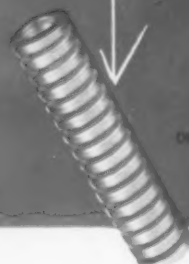
DOWEL PIN



STRIPPER BOLTS



CAP SCREWS



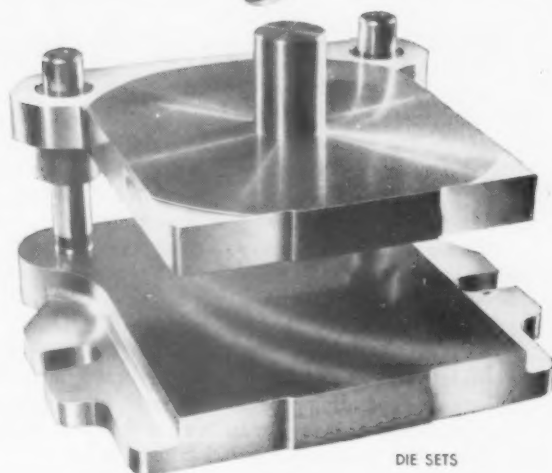
DIE SPRINGS

DANLY DIE SETS AND DIEMAKERS' SUPPLIES

When you start your tooling program by specifying DANLY Die Sets and Diemakers' Supplies, you are sure of . . .

1. *Reliable Danly precision—a standard of quality for more than 28 years.*
2. *Prompt delivery—completely stocked Danly branch assembly plants are located in nearly every major tool making center.*

That's why Danly is the first choice of diemakers everywhere!



DIE SETS

Send for this free Booklet today!

See how Danly's complete line will help you save tooling time.



DANLY MACHINE SPECIALTIES, INC.

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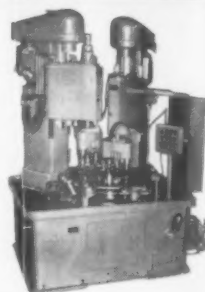
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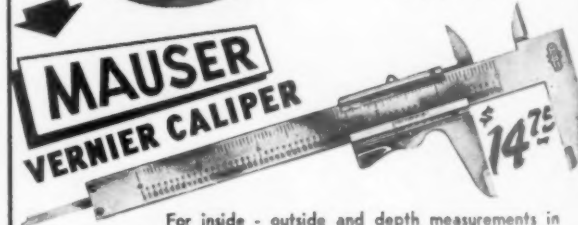
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2 blended radius reduces
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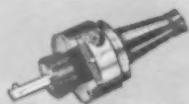
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 tests assure accuracy

4 knurled head provides
 quick sure grip

5 complete variety of
 sizes and lengths



Standard Drill Bushing



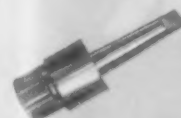
Boring Chuck



Mikro-Lok Boring Bar



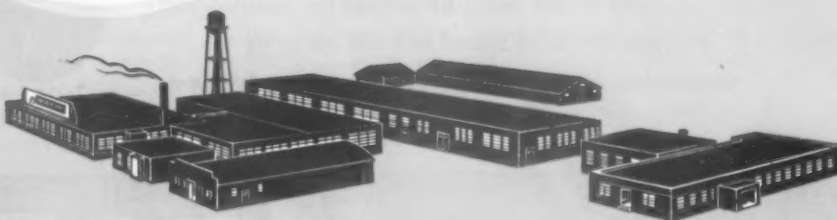
"Kwik-Switch" Tool Holder



Floating Chuck



Standard Collect Chuck

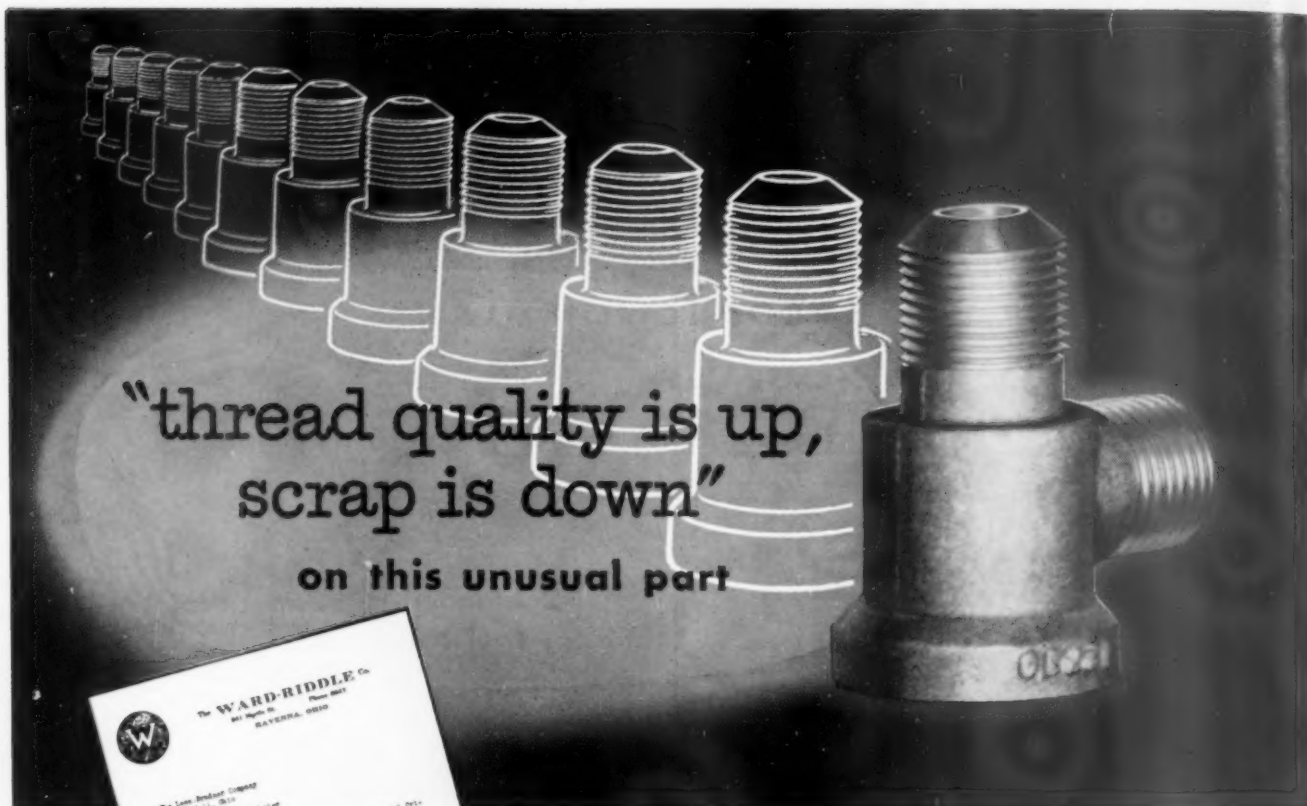


The modern home of finer production tools

UNIVERSAL ENGINEERING COMPANY

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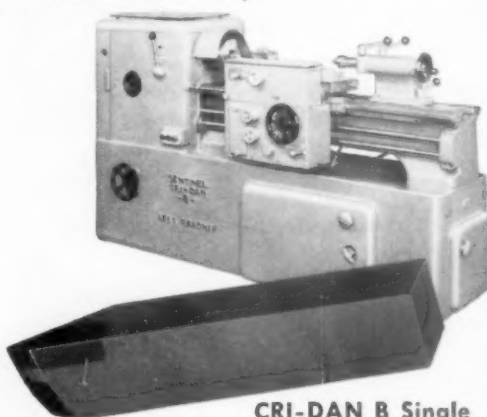
**"thread quality is up,
scrap is down"**
on this unusual part



Mr. Hugh W. Riddle of the Ward-Riddle Co. wrote our headline when he described the versatility and speed of the Cri-Dan, using a single point carbide tool. His production problem involved an aluminum casting for a flow control valve body.

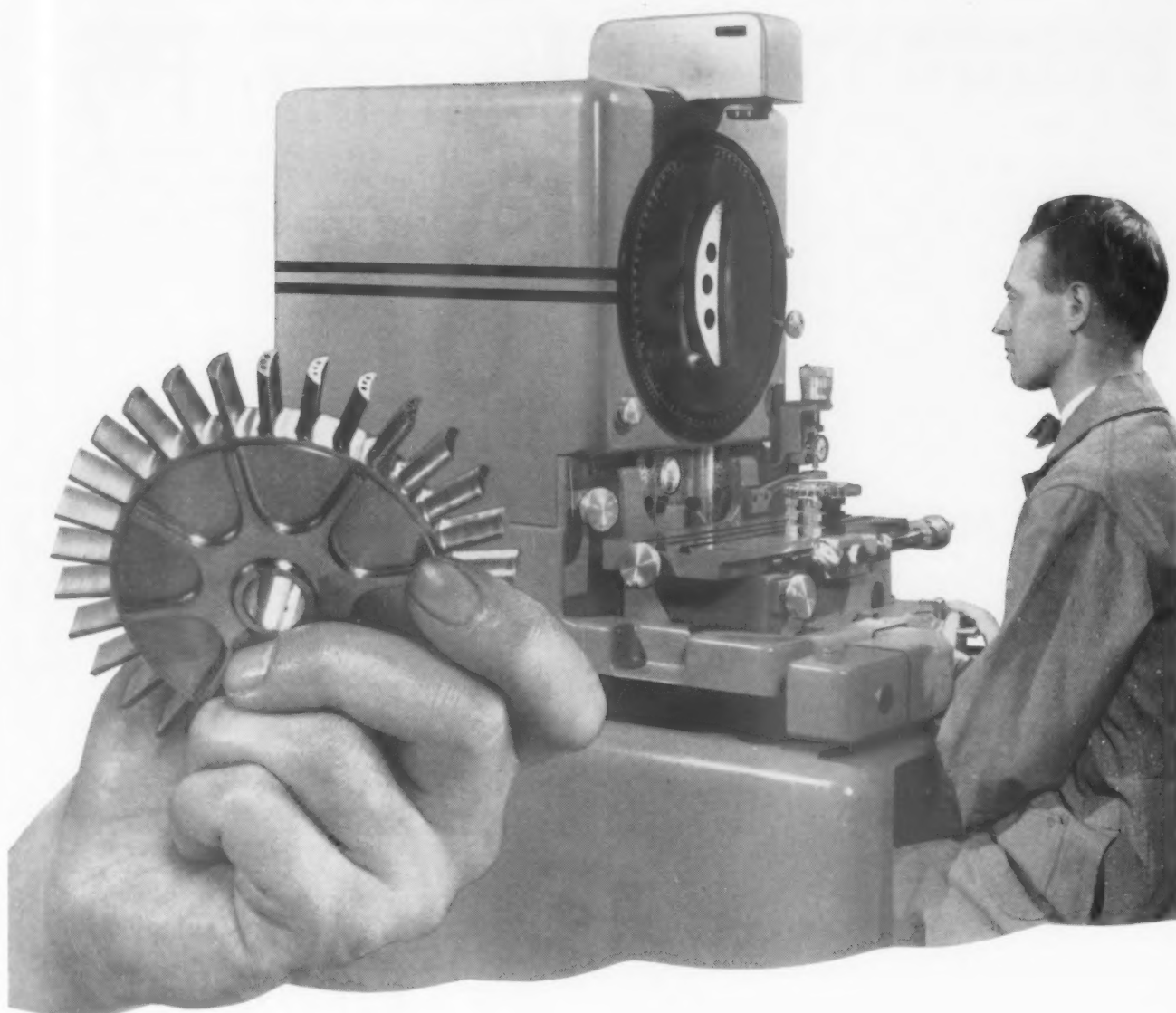
With his Cri-Dans, the job, (virtually impossible on a turret lathe) is accomplished in a total of 56 seconds per piece with only 1/2 of 1% scrap. This effects a tremendous savings in time, material and tool costs in addition to increasing production on the turret lathes.

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If you've been thinking of inspection by optical comparison only in terms of silhouetting simple parts, you may be overlooking a chance to lower your inspection costs, speed the work.

For example, with the Kodak Contour Projector, there's a trick made possible by the unique Surface Illuminator. To inspect the above impeller that goes into a jet engine component, Eclipse-Pioneer Division of Bendix Aviation Corporation projects the end of a blade by light directed straight on it out of the same lens that picks up the image. Conventional shadow projection just wouldn't do it.

In measuring this part, the two micrometers used operate independently of the elevating and cross-travel screws to eliminate strain and wear. They

are provided with dial pressure indicators—there's no "micrometer feel" required. The operator works unhampered by hoods or curtains, needs little training to get the work out in a hurry.

If your need is for toolroom measurement, the Kodak Contour Projector, Model 2A, is your choice. If your need is for fast production inspection, the economical, stripped-down Model 3 will meet your requirements. There is a field engineer in your area who will be glad to discuss your requirements with you. No obligation, of course. To get started, write to Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

If you want to check precision spur and helical gears in action, write for information about Kodak Conju-Gage Instrumentation.

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In the Steaming Jungles of the GRAN CHACO

Indians Use Marking Devices!

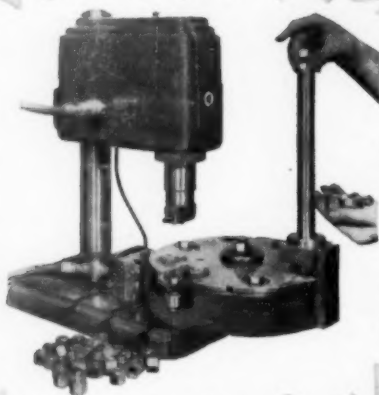
Deep in their South American jungle homes the Chaco Indians use tattooing extensively. The marking indicates rank, family, clan and achievement. These tattoo marking devices are extremely important to both Chaco braves and women. The higher their rank, the larger number and variety of tattooing designs.



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are Designed for ALL MARKING PURPOSES

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These CADILLAC Stamps, made of special alloy tool steel, insure long life and unexcelled performance. Stamps can be engraved to fit the contour of parts to be marked. Any design, trademark, lettering or numbering can be engraved in any size to fit your marking requirements.



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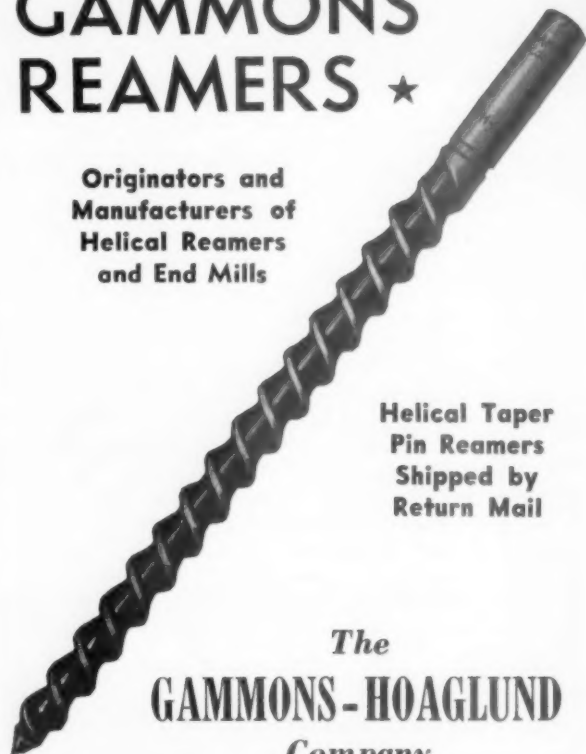
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THE *Logan* LATHE

Puts Profit In Production

Logan 940-2
Quick Change Gear
Turret Lathe
11" Swing, 1" Collet Capacity,
1 3/8" Spindle Hole

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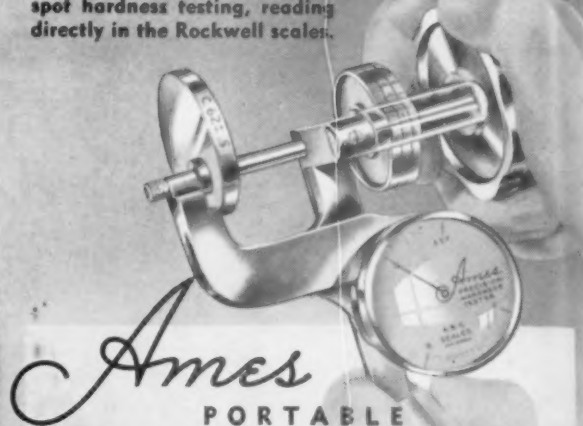
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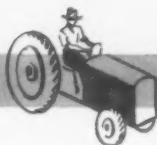
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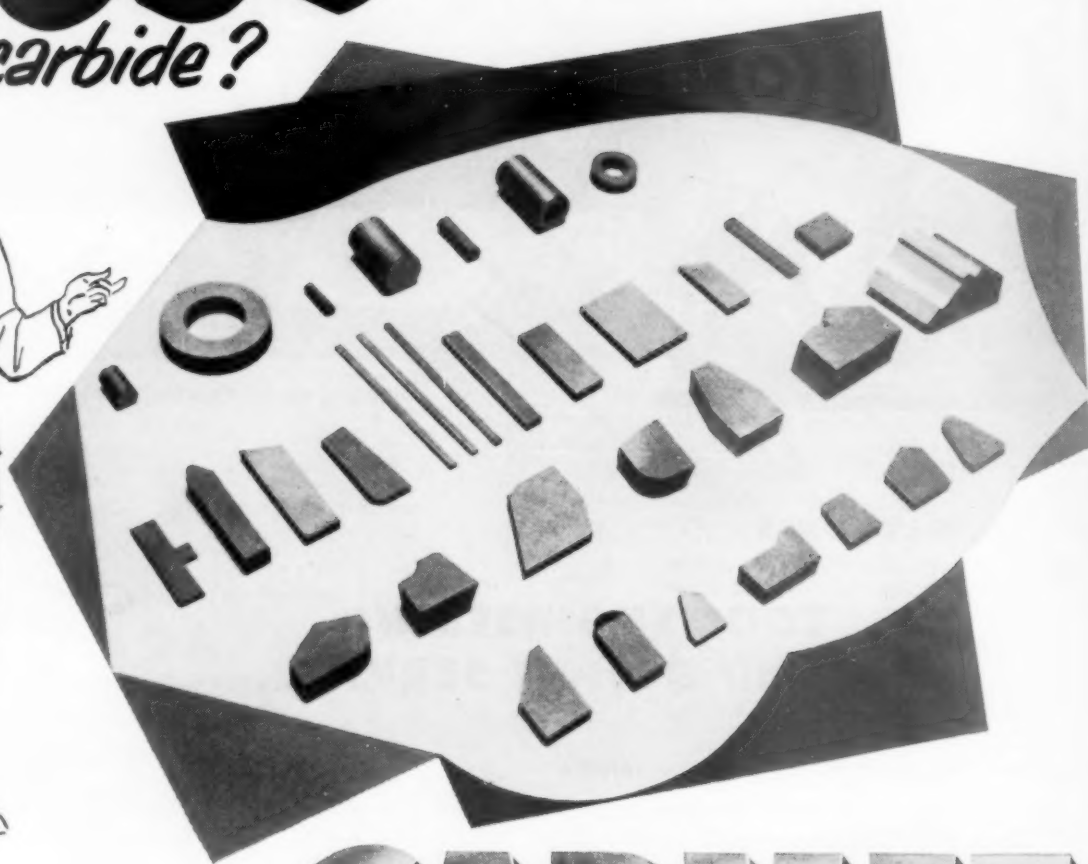
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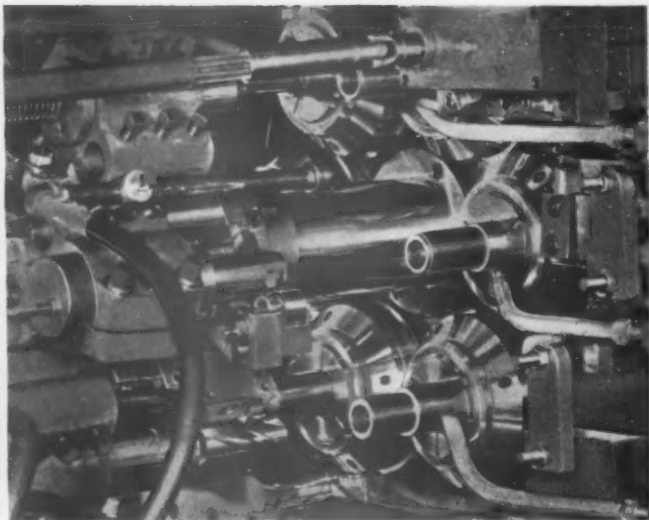
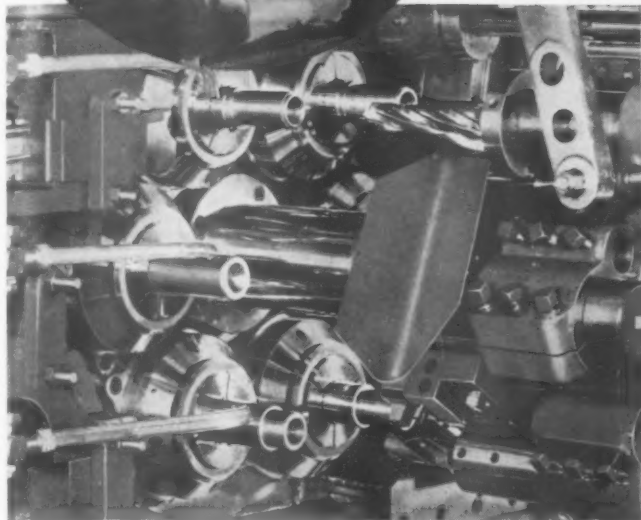
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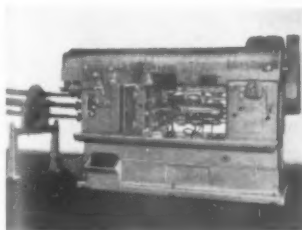
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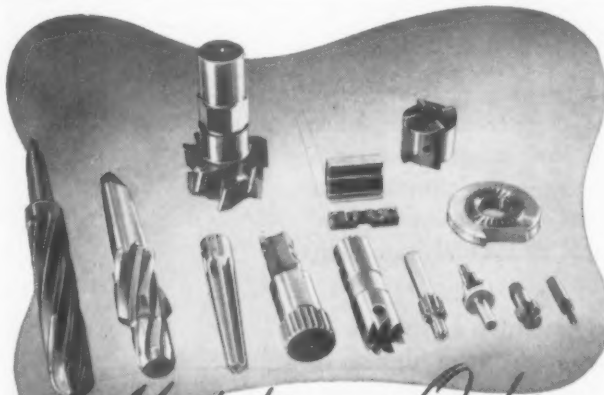


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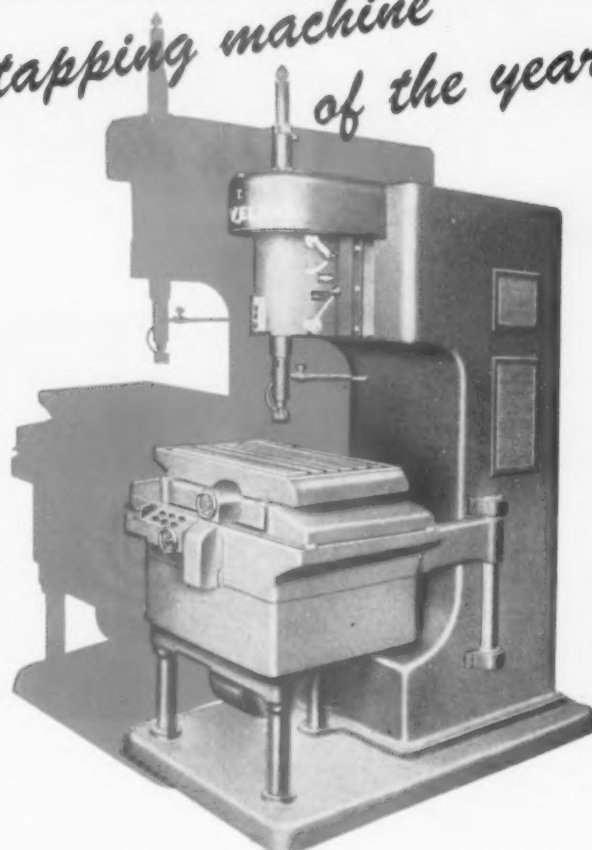


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*Automatically
and at High Speed*



At a speed of 3,000 plus per hour this conveyor-fed multi-inspection gage measures and sorts piston pins for hardness, triangular out-of-round, taper and diameter along the full length of the workpiece. The pins are

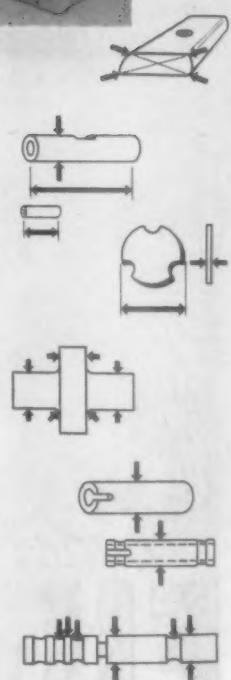
automatically sorted into ten disposal units: out-of-round, tolerance .00005"; taper, tolerance .0001"; hardness, O.K. and "bad"; diameter, five groups of .0001" difference, plus over and under.

The final inspection and sorting of mass-produced, similar parts is automatically accomplished by Federal Gaging and Sorting. These gages, made in various types to perform specific tasks, do their work automatically with uncanny precision and speed. Federal Automatic Gages reduce to the minimum non-productive inspection time, effect substantial savings in subsequent assembly, and eliminate useless machining of outsized pieces finally discarded as scrap.

The speed of automatic gaging is limited only by the speed of mechanical handling of the workpieces; parts can be gaged much faster than is required for all practical purposes. As for accuracy, extremely

high magnifications can be provided, with scales graduated in millionths or, when necessary, fairly low magnification and long range. Practically any dimension or several dimensions or dimensional conditions can be gaged by Federal Automatic Sorting Gages.

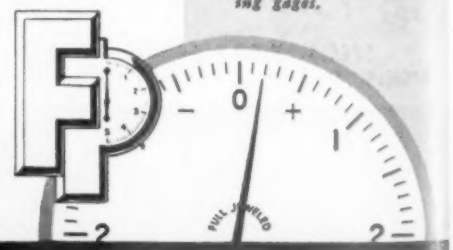
We have had extensive experience in the design and manufacture of high speed automatic and sorting gages and can recommend equipment to answer your particular needs. Write us for information on all types of automatic gages including multi-dimension, continuous measuring, machine control and automatic sorting gages. Federal Products Corporation, 1196 Eddy Street, Providence, R. I.

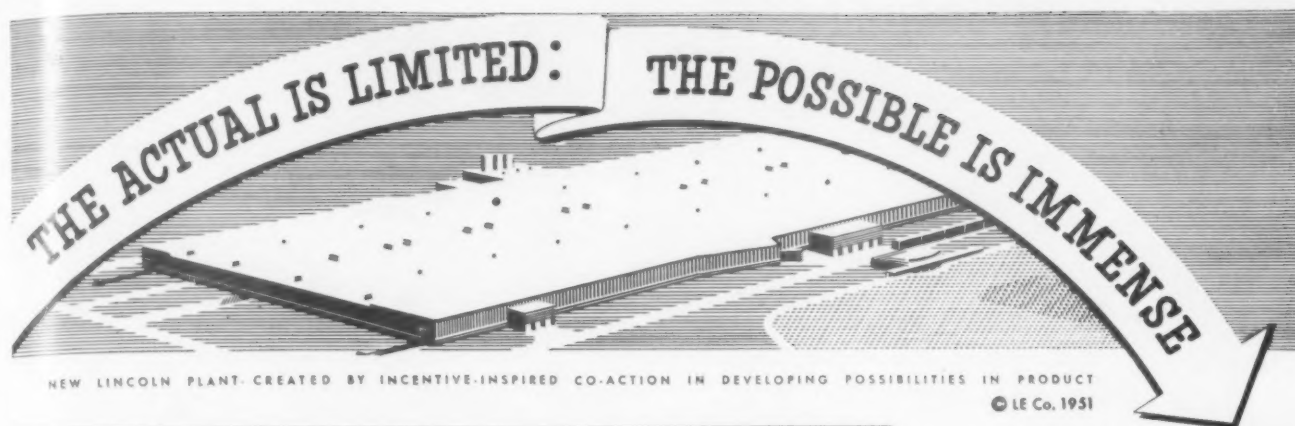


A few of the many dimensional inspections possible with automatic and sorting gages.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing all types of DIMENSIONAL INDICATING GAGES





NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1951

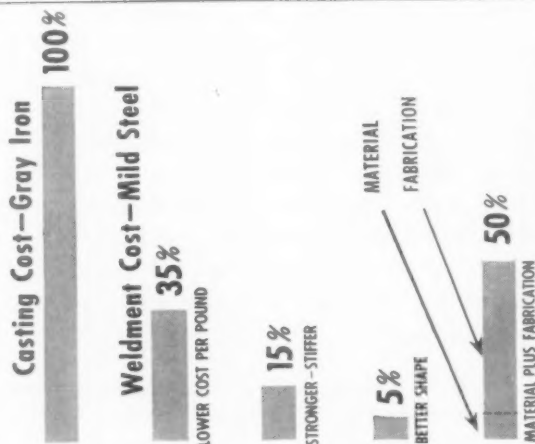
Welded design builds stronger products ... at half the cost

THE proper use of welded steel strengthens the construction of many products while cutting costs 50%.

As shown in Fig. 3, a simple duplication of a design in mild steel generally reduces material costs to as little as 35% of traditional gray iron construction. However, when designs utilize the inherently greater strength and rigidity of steel, still fewer pounds of metal are required and material costs can be cut to 15%. Ultimately, the efficient use of formed engineering shapes from sheet or plate can eliminate further metal, cutting the material expense to as low as 5%. With these substantial savings in material costs, the designer has a latitude of 35% to 45% in which to fabricate and still realize overall cost savings of 50% in the manufacture of his products.

Whenever weldment costs do not approximate this yardstick, designs generally are falling short of incorporating the full economies of welded steel. A Lincoln Welding Engineer will gladly demonstrate how you can benefit on present and future product developments. Call or write.

DESIGNS THAT UTILIZE THE ECONOMIES OF
WELDED STEEL ARE ALWAYS LOWER IN COST



YOU DESIGN THE SAVINGS

Fig. 3

PROPER DESIGN IN WELDED STEEL ALWAYS IMPROVES PRODUCT AND LOWERS COST

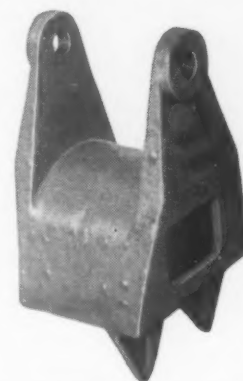


Fig. 1—Original Construction of hanger.
Cost....\$5.20. Weight 18 pounds.

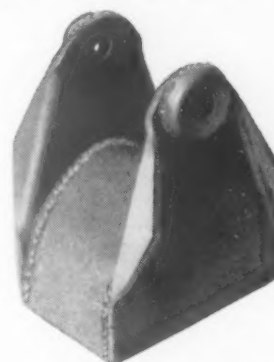


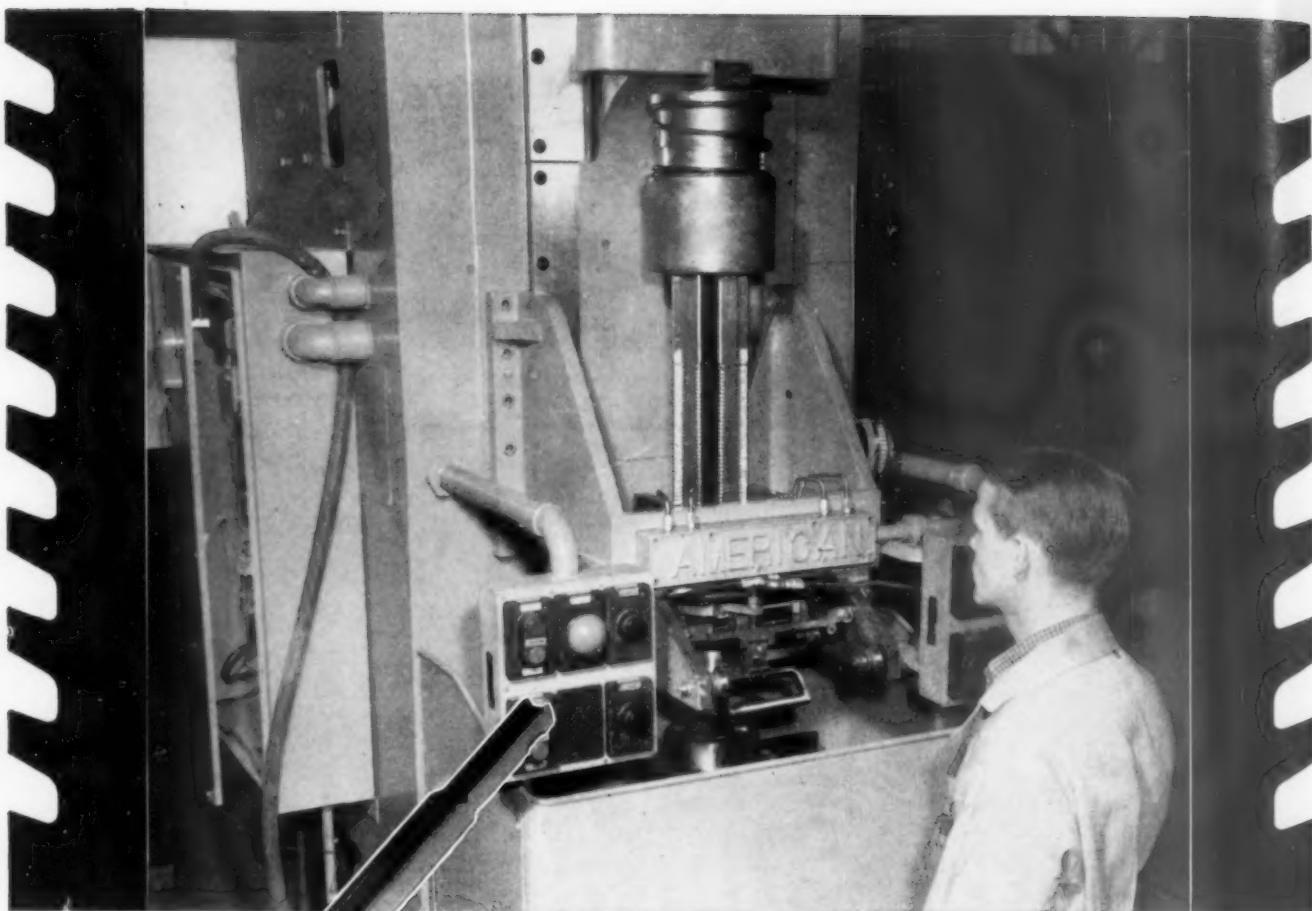
Fig. 2—Present Weldesign in Steel
Saves 52% in cost. Costs....\$2.50
Weights 12 pounds.

Photos courtesy Dorsey Trailer Company,
Elba, Alabama.

HERE'S MORE PROOF

Machine Design Sheets are available to designers and engineers. Simply write on your letterhead to Dept. 363.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO



ONE PASS *Broaches* SIX WINDOW OPENINGS

Typical result engineered the *American* way



A special, large, American-engineered, automatic, six station pull head, on a standard American VP 3-10-30 Vertical broaching machine, helps to speed production on this automatic transmission part. A total of twelve angular sides, plus twenty-four corner radii are finish broached on 150 of these steel forged parts per hour. The machine is equipped with an American-engineered fixture with a manually operated work slide interlocked with the machine cycle for maximum safety.

Developing jobs of this type is an everyday occurrence at American Broach. Your broaching job benefits from the skill and experience of American engineers . . . engineers who design all three . . . broaches, broaching machines and broaching fixtures. Remember, the best way to do your job within cost and production requirements . . . is the American Way.

Write for our new Blue & Gold catalog containing complete machine specifications. Address Dept. 7



American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



Speed up your production

Change tools without
stopping . . . or even
slowing the machine

MODERN-MAGIC QUICK CHANGE CHUCK and COLLET EQUIPMENT



Modern Precision Tools
Include

- STATIONARY SELF-OPENING
DIE HEADS
- ROTARY SELF-OPENING
DIE HEADS
- STATIONARY
COLLAPSIBLE TAPS
- ROTARY
COLLAPSIBLE TAPS
- MODERN-MAGIC
CHUCKS AND COLLETS
- SELF-OPENING
STUD SETTERS
- INSERTED BLADE
FACE MILLING CUTTERS
- SOLID ADJUSTABLE
DIE HEADS
- ADJUSTABLE HOLLOW
MILLING TOOLS
- UNIVERSAL CHASER
GRINDING FIXTURES

CHUCK →

RING →

COLLET →



A finger touch raises
the ring and releases
the tool . . . instantly

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly lost time of revolving spindle machines. Used with such machines, tools are changed without stopping or even slowing the spindle. Changes are made from drill to reamer to tap instantaneously and safely while the machine is running at cutting speed. In this way, the Modern-Magic Chuck and Collet Equipment gives multiple spindle range to single spindle machines, increasing production and cutting cost. In high production shops, it has been proved they save time even though used only for changing from dull to sharp tools.

For full information, send for Bulletin M-103.
In addition to standard Modern-Magic Chucks
and Collets, it shows special types of each.

Only the ORIGINAL Modern-Magic Chuck and Collet Equipment carry the name
"MODERN-MAGIC" and are manufactured by Modern Tool Works, Rochester, N.Y.

MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER NEW YORK

Here's a Husky **LIVE CENTER** For Heavy Duty

A long time favorite for heavy duty, this size has #7 Morse Taper and 5" body diameter.

Smaller body size down to 2-1/16" diameter for use on smallest tool room lathes.

Utility Tools



#7
Morse
Taper

(Also made with #1 through #6 Morse Tapers)

Loads at
100 R.P.M.
Radial
1047 to
7275 lbs.
Thrust
197 to
3460 lbs.

These PRECISION Centers run on replaceable Timken Bearings in oil. All bearing surfaces hardened and ground for frictionless operation. Shock pads reduce tool breakage. Try 'em.

THE J. C. **GLENZER** CO., Inc.
1552 E. NINE MILE ROAD, DETROIT 20, MICH.

USE READER SERVICE CARD; INDICATE A-6-164-1

PRECISION CIRCULAR CUTTERS



MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-6-164-2

Machine de-burring with **NOBUR** pays BIG production dividends!



NOBUR Tools turn a slow bench operation into fast and efficient machine work! Remove burrs on multi-walled parts with a smooth, clean cutting action that won't mar highly finished surfaces. Eliminate rejects from slow, costly hand work with files, scrapers and abrasives.

Nobur Tools are used on any lathe, drill press, portable drill or flexible shaft. Operation of the double-edge cutting blade is easy and safe . . . no skilled help is required, and the spindle never needs to be stopped for either de-burring or chamfering.

Nobur Tools cut freely on either hard or soft metals, are simple in construction and are made in sizes to cover a full range of hole diameters. *NEW "DS" SERIES extends range of **NOBUR** applications to holes as small as 1/8" diameter. WRITE FOR FULL DETAILS TODAY!

Parts like these quickly de-burred with



NOBUR MANUFACTURING COMPANY

717 N. VICTORY BLVD., BURBANK, CALIF.

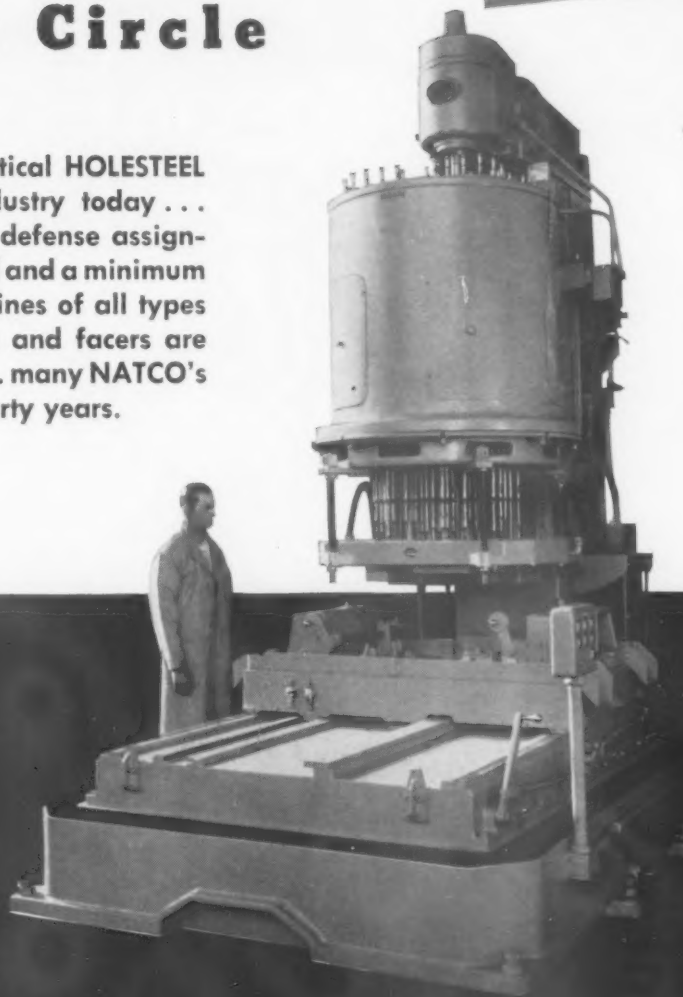
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MAMMOTH NATCO

Drilling 50 Holes on 36" Bolt Circle

*Natco Engineered
for
Quality Production*

NATCO Model C4B Vertical HOLESTEEL drillers are at work for industry today . . . doing tough peacetime and defense assignments with a maximum speed and a minimum of down time. NATCO machines of all types . . . drillers, borers, tappers and facers are veterans of years of service . . . many NATCO's are now in operation over forty years.



Call a Natco Field Engineer

to help you solve your problems in
Drilling, Tapping, Boring and Facing



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Tap breakage reduced to-



A Warner & Swasey No. 10 Precision Tapping and Threading Machine tapping four tiny Class 3 holes in the type cap piece for National Adding Machines (shown 1/2 size at right).

**ONE TAP
PER
15,000
PARTS!**



THAT'S the record of the Warner & Swasey No. 10 Precision Tapping and Threading Machine at The National Cash Register Company, Adding Machine Division, Ithaca, New York. The job consisted of tapping four tiny holes for No. 1-72 pitch threads to Class 3 fits on one small part in the adding machine's precision mechanism.

This operation was previously done on a drill press rigged with a tapping head. Tap breakage, despite operators' skill and care, averaged

20 taps a week with 7,000 parts produced.

But when the job was transferred to a Warner & Swasey, 15,000 parts were tapped with only 1 broken tap. The production bottleneck was quickly broken when production was upped from 175 to 300 pieces per hour.

For this company, the No. 10 was a *real* investment. Wherever your operations require precision tapping of Class 3 or 4 threads *on a production scale*, you can depend

on Warner & Swasey Precision Tapping and Threading Machines to reduce tap breakage, and practically eliminate costly rejections of parts due to inferior tapping in the final operations.

**WARNER
&
SWASEY**

Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

**SOLID STEEL
HEADS, CAPS
and MOUNTINGS
MACHINED from
SOLID BAR
STOCK**

**HARD
CHROME PLATED
PISTON
RODS**

**DIRT
WIPER
SEALS**



**STANDARD LEATHER CUP SEAL ASSEMBLY SHOWN IS
INTERCHANGEABLE WITH STANDARD PISTON RING
PISTON ASSEMBLY**

MILLER *High Pressure* **HYDRAULIC CYLINDERS**



FOUR-WEEK DELIVERY

To Meet Your

RUSH

Cylinder Requirements

... now assured by our modern new plant with greatly expanded facilities—devoted exclusively to the manufacture of quality cylinders.

Write for illustrated cylinder bulletins A-105 and H-10

COMPLETE MILLER CYLINDER LINE INCLUDES: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; PRESSURE HYDRAULIC CYLINDERS, 1½" to 6" BORES FOR 500 PSI OPERATION, 8" to 14" BORES 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" to 12" BORES, 2000-3000 PSI OPERATION MOUNTING STYLES AVAILABLE.



MILLER MOTOR COMPANY

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AIR AND HYDRAULIC CYLINDERS • ACCUMULATORS • COUNTERBALANCE CYLINDERS • BOOSTERS • AIR

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Benefits to You
No Broken Castings
No Scratch-Damage
to Piston Rods,
Bushings and Seals

**NO COSTLY
"DOWNTIME"**
NO REPAIRS
NO MAINTENANCE
NO POWER WASTAGE

Sales and Service from coast to coast

CLAUSING

HEAVY-DUTY PRECISION 12" LATHES 6300 SERIES



"OUTBOARD" DRIVE WITH DUAL A-BELTS

Clausing's drive mechanism is engineered to insure full transmission of power from motor to spindle, quicker speed changes, and easier belt replacements—you don't have to take the spindle assembly apart to replace belts. Drive is underneath with spindle pulley mounted outside so headstock can be enclosed—reverse gears, front spindle and small back gear run in bath of oil. For greater drive traction, the speed variation station is ahead of the speed reduction station, the speed reduction pulley is 8" in diameter, and the spindle pulley is driven by dual A-belts. Back gears are engaged *outside*.



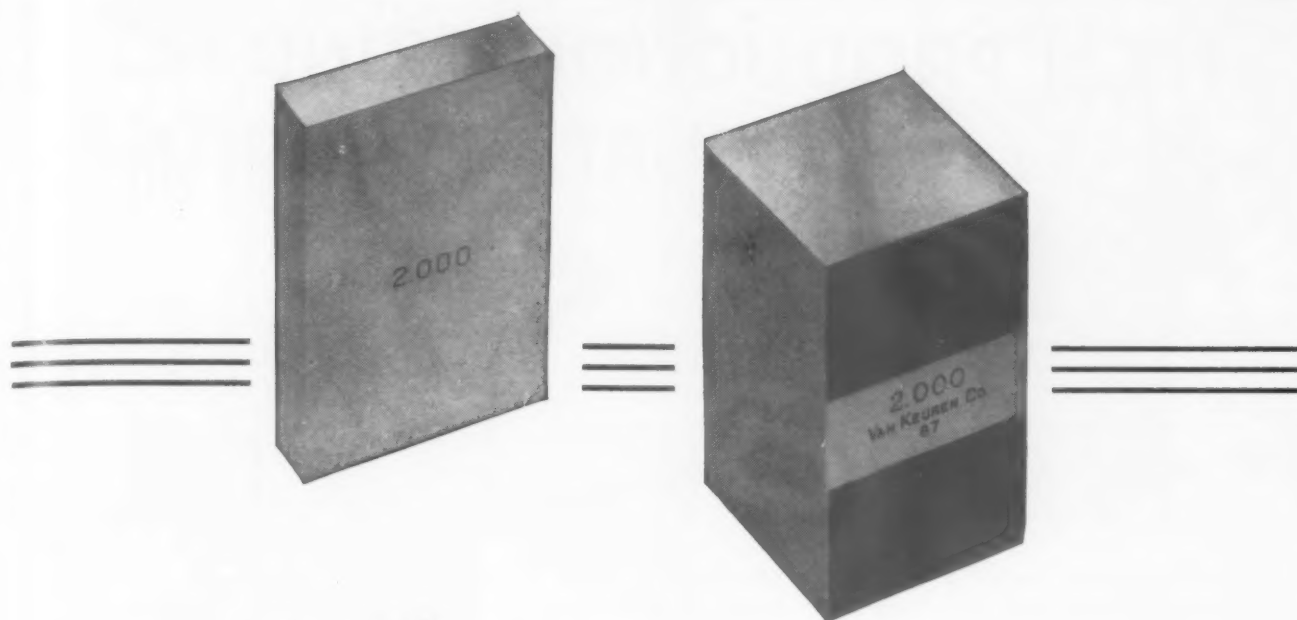
1" COLLET CAPACITY, 1 3/8" BORE, TAPERED KEY-DRIVE SPINDLE

The precision-ground steel spindle with 1 3/8" bore, 1" Collet capacity, and hardened, ground tapered nose is another of the many features that make Clausing 6300 lathes outstanding in tool rooms and production shops. Others include Timken bearings, splash-lubricated apron and quick-change gear box, heavy duty precision-ground bed. Standard drive provides 8 speeds between 50 and 1300 RPM. "Vari-drive" provides *every* speed between 30 and 1400 RPM. Check *all* the features of this unusual lathe at your Clausing distributors, or send for catalog. Delivery is prompt on priority rated orders.



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ATLAS PRESS CO.
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Van Keuren

GAGE BLOCKS

Conventional Rectangular
Gage Block.

.360 by 1.375".

Area .51 square inches.

For ordinary use.

SOLID SQUARE
MASTER BLOCK.

1 1/4" by 1 1/4".

Area 1.56 square inches.

The 30 Year Blocks.

Read about the startling wear tests on Van Keuren Solid Square Master Blocks.

They are unconditionally guaranteed against wear in excess of .0001" for 5 years for any reason whatsoever.

Write for your Van Keuren 1952 Catalog and Handbook No. 35

THE

Van Keuren

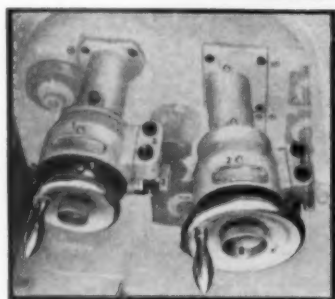
CO.,

174 WALTHAM STREET, WATERTOWN, MASS.

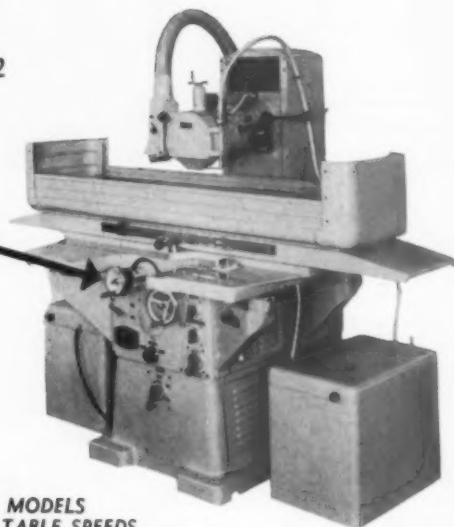
33rd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

HIGH PRODUCTION GRINDING with the **BLOHM** SURFACE GRINDER



Model HFS 6/52



Easy operation and positive control of handwheels. Micro-Jog (electric controlled fine adjustment) makes possible .0005 accuracy for the cross movement and .00005 for the vertical movement.

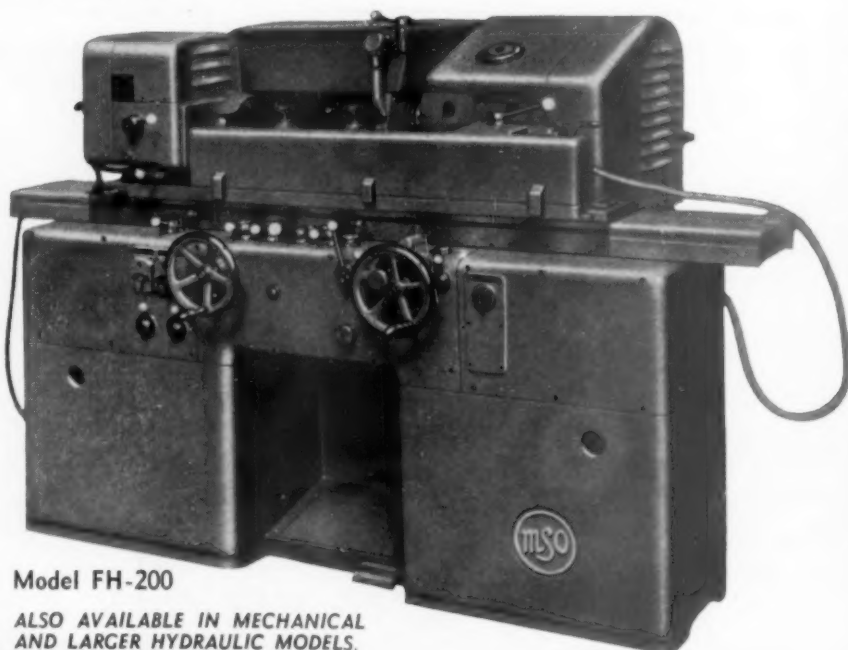
Specifications	HFS 4/52	HFS 6/52	HFS 8/52
Working Range	15 $\frac{3}{4}$ " x 11 $\frac{3}{4}$ "	23 $\frac{5}{8}$ " x 11 $\frac{3}{4}$ "	31 $\frac{1}{2}$ " x 11 $\frac{3}{4}$ "
Table Surface	20 $\frac{1}{2}$ " x 11 $\frac{3}{4}$ "	28 $\frac{1}{2}$ " x 11 $\frac{3}{4}$ "	36 $\frac{1}{4}$ " x 11 $\frac{3}{4}$ "

THE 3 MODELS
HAVE TABLE SPEEDS
RANGING FROM ZERO TO
49 FEET PER MINUTE . . . OPERATE WITH 10 H.P.

The HYDRAULIC CYLINDRICAL GRINDER WITH ACCURACIES TO .00004"

The in-feed of the grinding wheel is made by handwheel or automatically for each table reverse. It is adjustable by a knurled screw from .0001" to .0004". After reaching zero position, the in-feed of the grinding wheel is stopped automatically. By a push on a finger lever an in-feed amount of .0001" can be obtained, and if the knurled screw is turned, the scale can be advanced or put back by .00004".

This model is available in 3 sizes with center distances of 16", 30" and 40". All models have a swing of 5 $\frac{1}{2}$ " and operate with 7 $\frac{1}{2}$ HP.



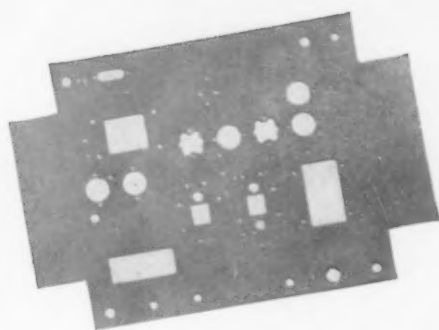
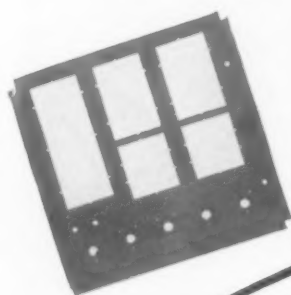
Model FH-200

ALSO AVAILABLE IN MECHANICAL
AND LARGER HYDRAULIC MODELS.


KLINGELHOFER

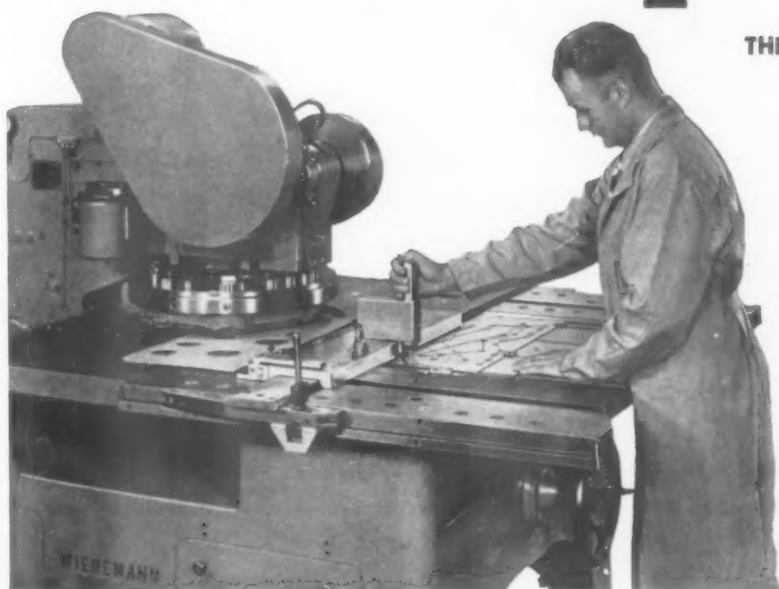
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MACHINE TOOL CORP.
KENILWORTH, NEW JERSEY**

if you produce...



SEE WIEDEMANN

Bulletin 241 describes the most efficient method of producing chassis and similar work in short runs and semi-production runs. Repeat runs of 5 to 1,500 pieces and single runs of 50 to 5,000 pieces are economically produced on the Wiedemann RA-41P. Write today for bulletin 241.



THE WIEDEMANN METHOD permits you to: (1)

Keep up with engineering changes without materially affecting production schedule; (2) Keep tool inventory low; (3) Produce quantities in accordance with sales requirements; (4) Produce accurate work with inexpensive tools.

"THE WIEDEMANN METHOD" through the elimination of expensive punch and die set-up and work location methods, provides an efficient means of piercing single pieces, and semi-production runs, regardless of repeat frequency.

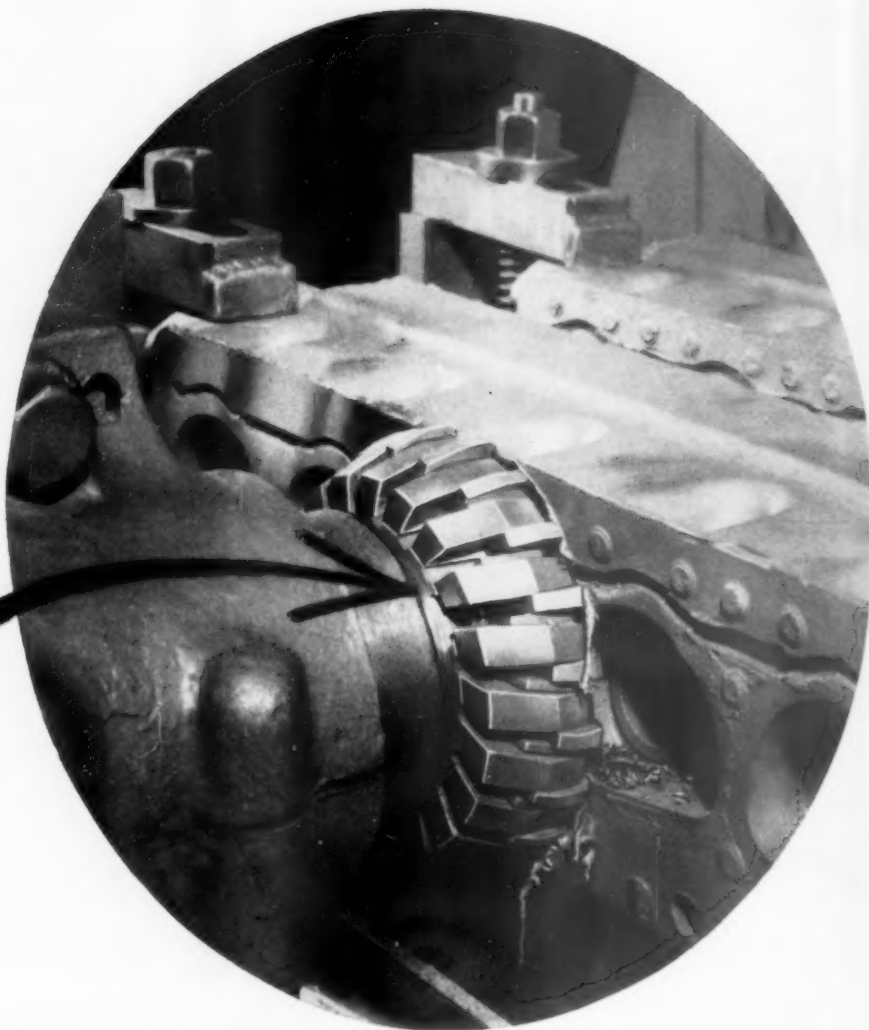
Machines available for piercing sheet and plate up to $\frac{1}{2}$ " thick, up to 120" wide x 200" long.

Wiedemann
TURRET PUNCH PRESSES

WIEDEMANN MACHINE COMPANY

4245 WISSAHICKON AVE., PHILADELPHIA 32, PENNSYLVANIA

speed up cast iron milling jobs



with
HAYNES STELLITE
Trade-Mark
ALLOY TOOLS

High compressive strength at cutting temperatures . . . good impact strength . . . and extremely low frictional coefficients make HAYNES STELLITE alloys ideal tool materials for cast iron milling jobs.

Two hard grades of HAYNES STELLITE alloy are available for milling cast iron at high speeds. On soft cast iron (less than 185 Brinell), these tools can take light milling cuts at speeds up to 300 surface ft. per min. For heavy milling, speeds up to 250 surface ft. per min. can be used.

Hard cast iron up to 240 Brinell can be milled at speeds as high as 200 surface ft. per minute. Safe chip loads range up to 0.025 in. per tooth.

Tougher grades of HAYNES STELLITE alloy are available for efficient milling of castings that have irregular contours, surface imperfections, or inclusions, or where there are variations in chill depth.

HAYNES STELLITE alloy tools are available as fabricated shell-end mills and as insert milling-cutter blades. The different grades of alloy can be used for a wide variety of milling conditions. If you wish help on your own particular milling problems, write to the nearest Haynes Stellite Company office.

For a copy of the new manual, "HAYNES STELLITE Metal-Cutting Tools," write to our General Offices.

HAYNES
TRADE-MARK

alloys

Haynes Stellite Company

A Division of
Union Carbide and Carbon Corporation

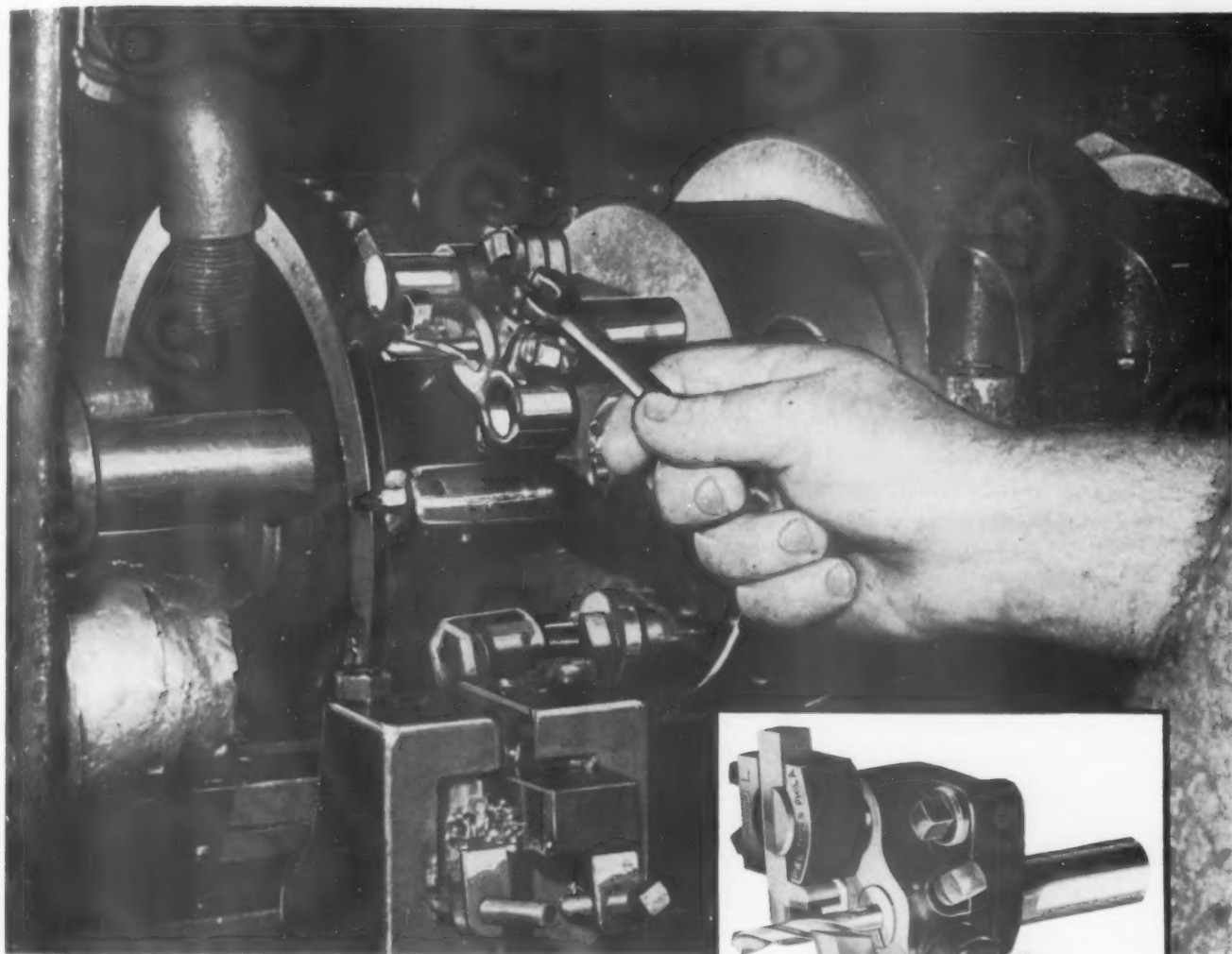


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**Precise as the Men
Who Use Them -**

THE R and L TURNING TOOL

R and L Turning Tools make this job easier and increase production capacity, by saving tool changing time. Selected because of dependability and precision, the R and L Turning Tool can be used to perform fourteen different jobs. Equipped with Tantalum Carbide backrests, the metal surface remains unmarred. Truly, R and L Tools are tops in precision tools. Write for complete catalog.

RIGHT and LEFT TOOLS

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TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL
RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS

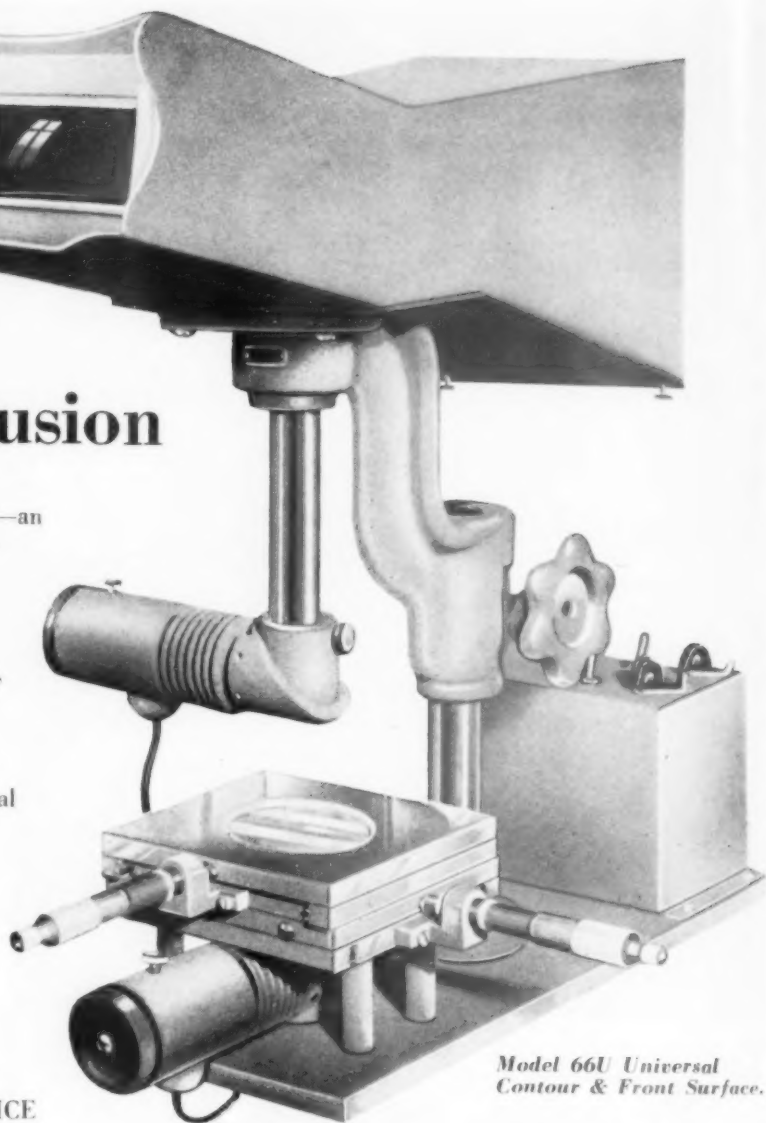
an optical conclusion

OPTICAL PROJECTION—an industrial tool enjoyed by many progressive firms is denied others for three basic reasons: (1) High Cost, (2) Narrow Choice of Apparatus, (3) Inexperience in Its Use.

(1) Each of ten (10) Stocker & Yale Projectors is a working tool, economical yet of highest optical and mechanical perfection. **LOW COST** is achieved in Stocker & Yale Projectors.

(2) Each of ten (10) Stocker & Yale Projectors offers specific application advantages for volume processing of production. Compact, convenient construction in each case tremendously expands application opportunities. **BROAD CHOICE** of APPARATUS is achieved in Stocker & Yale Projectors.

(3) Each of ten (10) Stocker & Yale Projectors used with S&Y designed staging fixtures makes optical projection more than an inspection or gaging device—it is an assembly aid, an adjusting or setting instrument, a machine output control. Light exerts no pressure, is always positive, makes pictures of the conditions by shadow or reflection. **EXPERIENCE** in these principles is a part of every Stocker & Yale Projector.



Model 66U Universal
Contour & Front Surface.

Write Factory for Complete
Projection Catalog

Stocker & Yale

INCORPORATED

MARBLEHEAD, MASS.

“somewhat prejudiced optical engineers

for better production through projection”

Tough little jobs become easy with

BEHR-MANNING *Special* Abrasive Tools

MUSHROOM® SANDING PADS AND DISCS

Shape and polish low areas as drawing-die work, deburr and polish edges, finish concave or flat surfaces.

METALITE® CLOTH SPIRPOINTS®

Mounted on threaded mandrels, they produce high finishes in odd-shaped recesses or on various radii.

METALITE CLOTH PENCILS

Used on a mandrel for polishing channels, fillets, rounded corners, and the side walls and bottoms of "dead-end" holes.

METALITE CLOTH SLOTTED DISCS

When pushed into a hole, the slots enable the sections to overlap, polishing the hole surface. Fine for radiusing and deburring drilled openings.

SPIRABANDS®

For Deburring edges and finishing interior surfaces of drawn, sheared or stamped metal parts. Fit expanding rubber drums on portable tools.

SPIRACORDS®

Narrow strips of METALITE cloth wound spirally. Can be used on mandrel, or may be threaded like cord through holes for polishing and deburring edges.

Want to deburr a hard-to-reach spot on a production job, polish an inside surface, round a corner, chamfer an edge, or what have you? Among these BEHR-MANNING Abrasive Tools you will find just the right trick to handle the operation in jig-time and safeguard your profits. These tools are all adaptations of the famous BEHR-MANNING METALITE® Cloth, but so formed as to work on a mandrel or expanding drum, in any chuck on a portable or stationary spindle. They're available in a wide range of sizes and grits.

Look these tools over with your own production problems in mind. Make your own check-up, or better still let your local BEHR-MANNING Abrasives Engineer do it — write us.

The booklet "Blueprints for Production" gives various case histories that show you new ways to cut costs with BEHR-MANNING coated abrasives. Write for it — address Dept. TE-6.



® *Trade marks.



BEHR-MANNING
CORPORATION

division of NORTON Company

- ▲ COATED ABRASIVES
- ▲ SHARPENING STONES
- ▲ PRESSURE-SENSITIVE TAPES

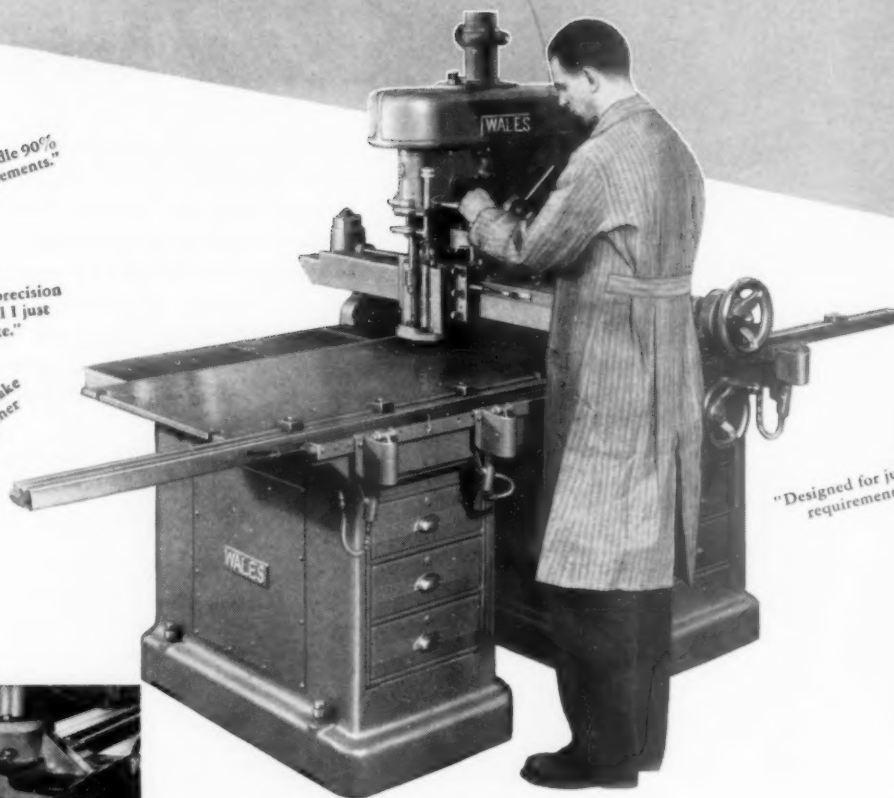
Main Office and Plant: Troy, N. Y.
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TYPICAL COMMENTS HEARD AT ASTE SHOW ABOUT WALES DRILLING MACHINES

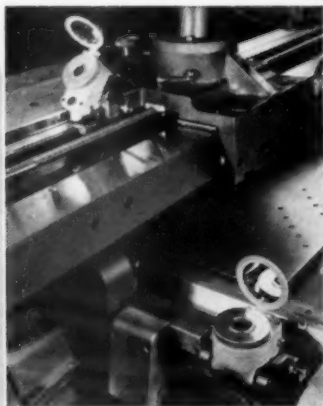
"This Machine would handle 90% of my jig boring requirements."

"I didn't know what a precision machine this was until I just watched it operate."

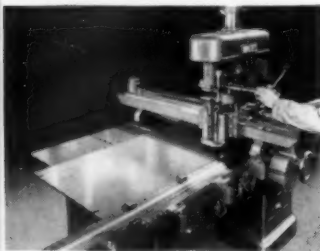
"Simplicity and precision make this different than any other machine I've seen."



"Designed for just my requirements."



Showing the 2 built-in "Scan-A-Scales" that accurately locate drill head and slide rail for "zeroing in". Air locking clamps hold the work rigid during drilling operations.



Showing a hole in the work being reamed by simply interchanging the drill and bushing with corresponding size reamer and reamer bushing.

● It's not what we say but what users and prospects comment about WALES DRILLING MACHINES that really tell the story.

Wales Drilling Machines are specially designed, precision engineered and accurately constructed to meet the close tolerance requirements of locating, drilling and reaming holes in material of practically any length and up to 36" wide. *There is no other drilling machine or jig borer like it.*

Built-in "Scan-A-Scales" calibrated in ten thousandths of an inch accurately locate drill head and slide rail taking over after rough positioning by rapid traverse.

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choose it . . . and you'll be sure of fast, free-cutting performance, less chance of breakage and more work between resharpenings. So, put the "first team in drilling" to work for you . . . today.

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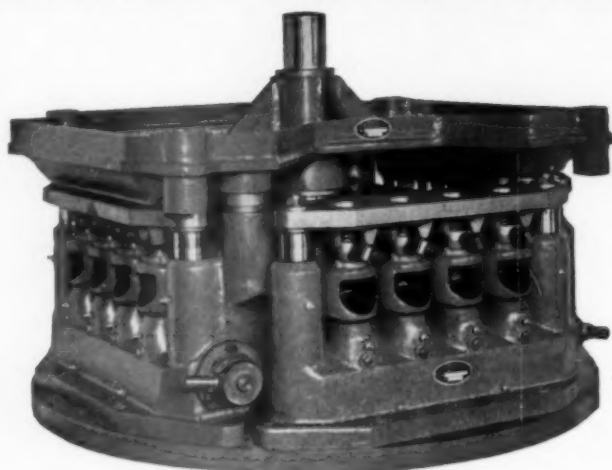
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All lock parts are Hardened and Ground

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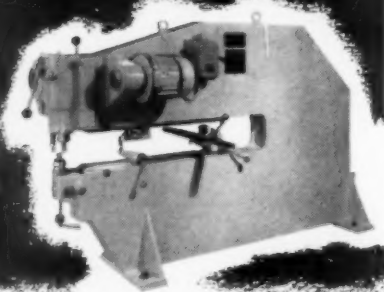
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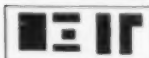
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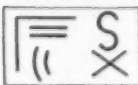


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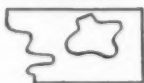
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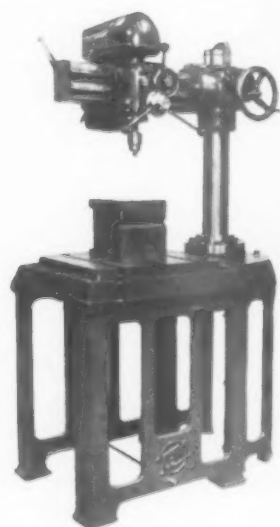
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The Tool Engineer

See how Norton New-Process Wheels

bring new efficiency...

new economy...

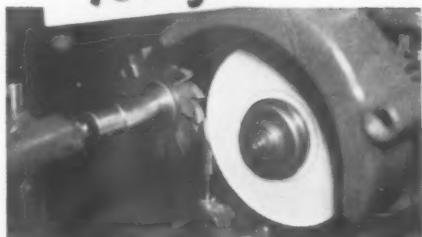
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grinding

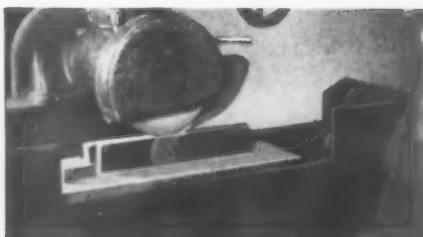


Norton New-Process Wheels Are Truly Uniform Within Themselves And From Wheel to Wheel . . . Unmatched For Inherent Balance And Grinding Efficiency.

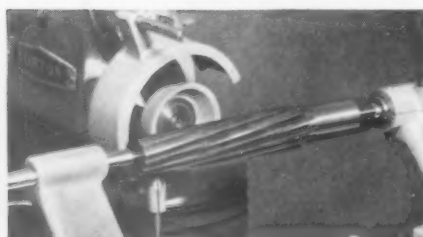
You get:



IMPROVED GRINDING OPERATION. More uniform wheel-structure assures even wear . . . fewer machine adjustments . . . longer service life . . . identical top performance from identically marked wheels.



IMPROVED RESULTS. Built-in balance reduces vibration . . . eliminates chatter marks . . . permits closer tolerances and smoother finishes . . . and lasts as long as the wheel.



IMPROVED TOOL MAINTENANCE. You can take heavier cuts on expensive tool steels without drawing tempers or risking spoilage. Tools stay sharp longer . . . last longer . . . with fewer trips back to the crib.

AVAILABLE IN A RANGE OF ALUNDUM* ABRASIVE TYPES

New-Process Wheels are made in sizes up to 14" diameter in the various types of ALUNDUM (aluminum oxide) abrasive — Regular ALUNDUM, 19 ALUNDUM, the new and outstanding 32 ALUNDUM, 38 ALUNDUM and 57 ALUNDUM. These fast-cutting, cool-cutting abrasives are ideal not only for the complete range of toolroom grinding but for many other jobs on materials of high tensile strength.

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Here's a man who knows which type and size of wheel is best for each grinding job. And if your problems are unusual, he'll call in a Norton Abrasive Engineer for additional expert advice. See your Norton Distributor for the right Norton Wheel for any grinding application.

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To Speed production and *Cut* costs...

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SCULLY-JONES

DRILL and TAP CHUCKS

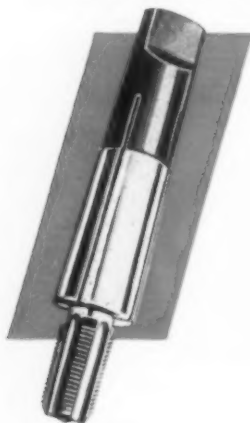
Save costly set-up and down-time: No moving parts to get out of order. Simple one-piece design. Easy to insert or eject from any Morse Taper hole. Broached square provides positive drive...eliminates slipping and tool damage. Collet action automatically centers tool.

Reduce tool replacement: Carefully hardened to resist nicking and burring, which often cause misalignment and tool damage. Built to withstand modern production methods and outlast many drills or taps.

Drill and tap accurately: Bore and shank machined concentrically to assure true-running tools and reduce rejects.

Work on close centers: Small body diameter makes these chucks ideal for close center and multiple spindle work.

Reduce drilling costs: Get additional savings, by using new extra flute length drills now made by many drill manufacturers. Only 4 Style "B" Drill Chucks required to drive the 41 new drill sizes, 1/2" and over.



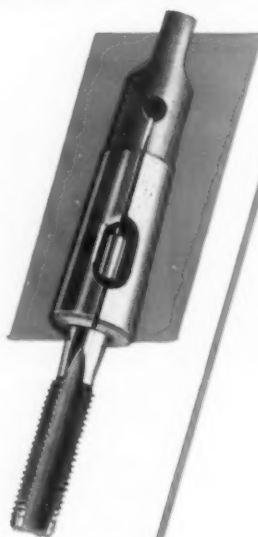
**"STYLE A"
SCULLY-JONES TAP CHUCKS**

Save costly "Set-Up" and "Down-Time". Drive tap by the square — center by the shank — hold with a collet action. Tap holes accurately; ground concentric to eliminate bell-mouth, and over-size tapped holes.



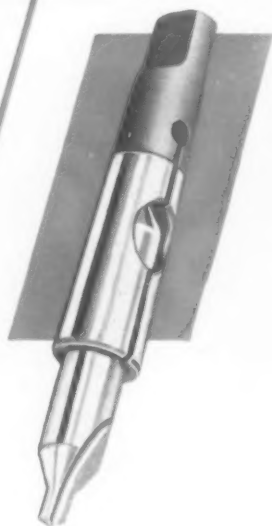
**"STYLE B"
SCULLY-JONES DRILL CHUCKS**

For driving straight shank drills. Make possible 25% or more saving. Small diameter makes them ideal for close center or multiple spindle work. Easy to use. Positive drive; no slipping. Accurate drilling.



**"STYLE B"
SCULLY-JONES TAP CHUCKS**

Similar in design to Style "B" Drill Chucks. Permit close center distances because they are smaller in diameter than the spindle. No moving parts to get out of order; require no adjustments.



**"STYLE B" — SCULLY-JONES
CENTER DRILL DRIVERS**

For driving combined center drills and countersinks—regular and bell styles. Simple one-piece tools; small diameter makes them suitable for work on close centers.

Send for New Bulletin No. 1-50
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Supersedes all previously published
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in
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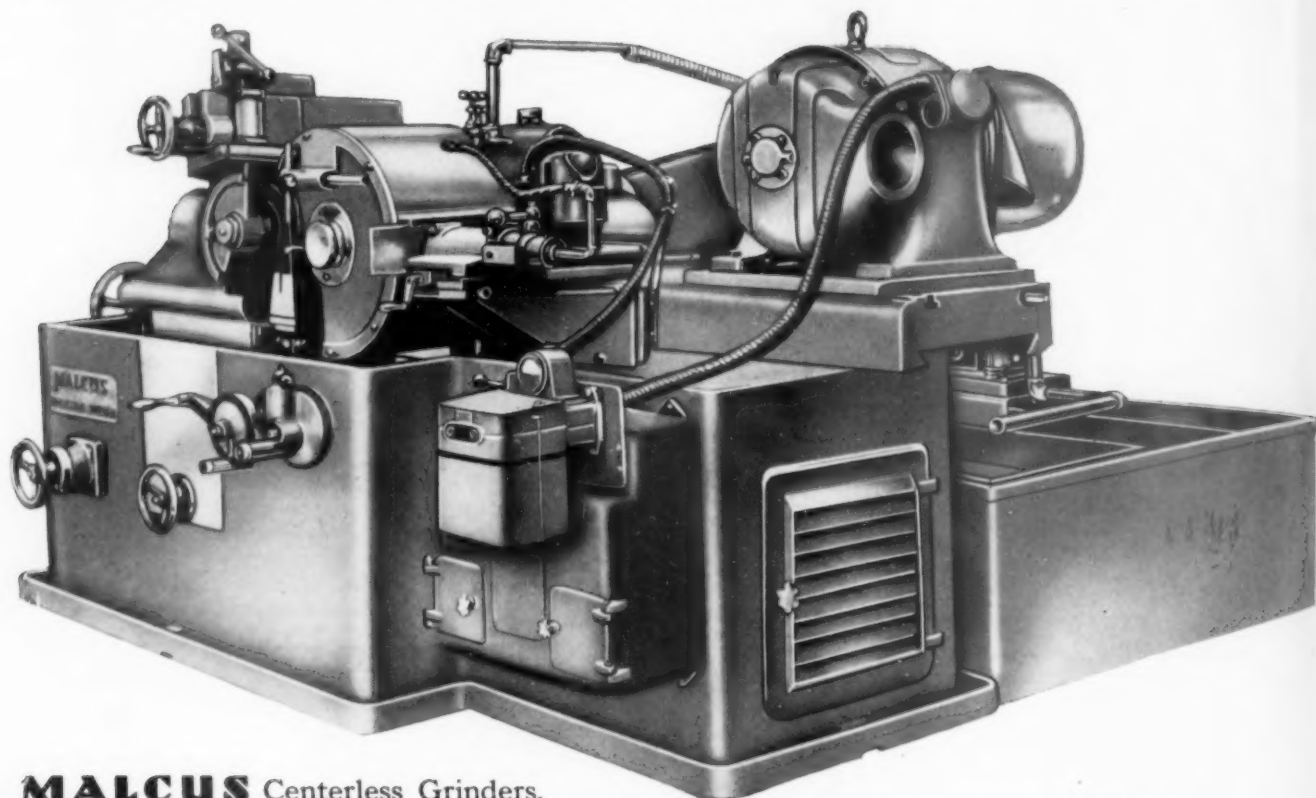
CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

June, 1952

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-181

181

MALCUS CENTERLESS GRINDER



MALCUS Centerless Grinders, made in Sweden, are built to meet the accuracy, production, and versatility required by industry. In addition to in-feed and through-feed operations, these machines, with suitable attachments, can grind tapers or profiles.

CHECK THESE OUTSTANDING FEATURES:

- Strong and rigid construction.
- Adjustable grinding and regulating wheels for handling all diameters within full capacity of machines.
- Main spindle supported by long, plain bearing.
- Automatic, circulating lubrication system for main bearing.
- Feeds can be adjusted rapidly during grinding operation. Regulating wheel has individual drive and controls.
- Micrometer adjustment of regulating wheel and its dressing device provides for a higher degree of grinding accuracy.
- Marks on bars are eliminated by floating rollers on feed tables.

TYPICAL GRINDING RESULTS:

Straightened bars from 3/16" to 5/16" in diameter, with a stock removal of .010" to .020", can be finish ground in one pass at a speed of 25 to 30 feet per minute.

GRINDING CAPACITIES				
Type	MC2*	MC3	MC4	MC5
Largest Diameter	2 3/8"	2 3/8"	6"	6"
Smallest Diameter	.004"	.004"	.020"	.020"
Max. Length-In-feed	5 7/8"	5 7/8"	9 7/8"	10-7/16"

*Type MC2 is designed mainly for in-feed grinding. Construction differs from other types.
Grinders can be equipped with regular and automatic bar feed tables, hopper feeds, or special feeding devices.

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COSA CORPORATION
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Your source for all Precision Machine Tools—
from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

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Seven styles of Firthite General Purpose Tools, which may be easily modified if necessary, will perform the majority of all machining operations. A variety of engineered, quality controlled Firthite sintered carbide grades assures maximum efficiency in metal removal. A Firth Sterling Service Engineer will be glad to aid in selecting the style and grade best suited to your particular application.

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ADAMAS

**...now has a complete range
of solid carbide inserts
in stock for you!**

ADAMAS rounds out its line and brings you GOOD NEWS ON FAST DELIVERY for all of your finish ground solid carbide insert blanks and centerless ground solid cylinders, in a complete range of styles and sizes. Your orders will be shipped IMMEDIATELY from our large and adequate stocks, they're available in all of the standard grades for these styles of blanks.

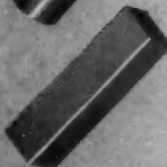
Our new Stokes S-5—a high production press of the largest type in use in the carbide industry—ASSURES YOU of the USUAL PROMPT ADAMAS SERVICE of SC, TB, SQ, and RB style blanks.

Smart carbide users always

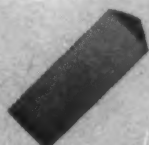
Specify **ADAMAS TUNGSTEN CARBIDE**
for the triple advantages
of quality, delivery and price



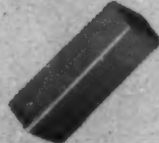
Style SC Solid Round Inserts
for Boring Tools, Insert Type
Tools, and wear parts



Style RB Rectangular for
Insert Type Tools all finish
ground.

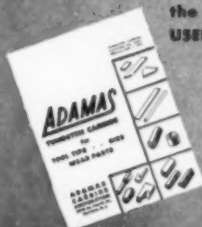


Style TB Triangulars for
Insert Type Tools



Style SQ Squares for
Insert Type Tools

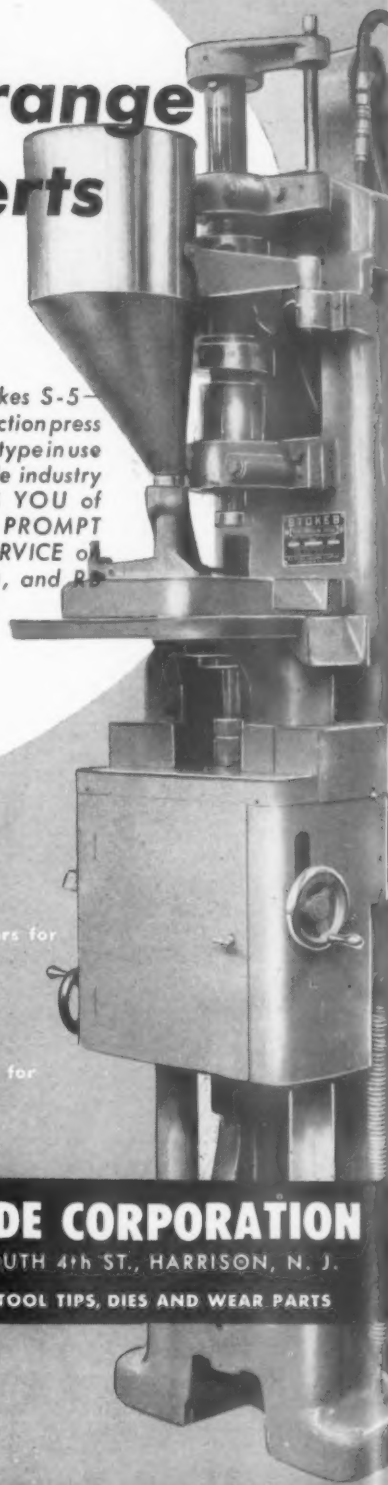
Send today for the NEW
ADAMAS CATALOG #A851
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USERS"

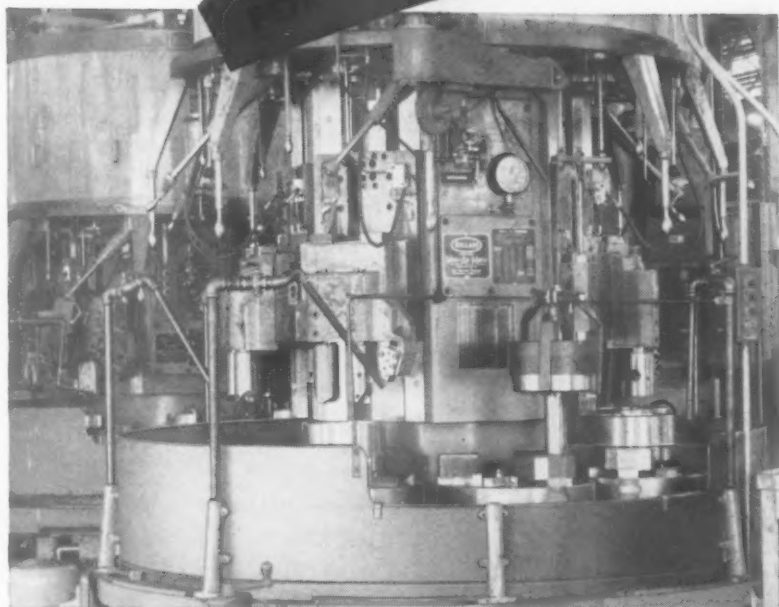


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PRODUCERS OF TUNGSTEN CARBIDE TOOL TIPS, DIES AND WEAR PARTS





The Mult-Au-Matic Method of machining work originated back in 1914.

This method, whether it is with 4, 6, 8, 12, or 16 spindles, has a basic time element for Manufacturing Economy. The time to produce a finished piece of work is equal to the time for the longest operation plus a few seconds for indexing.

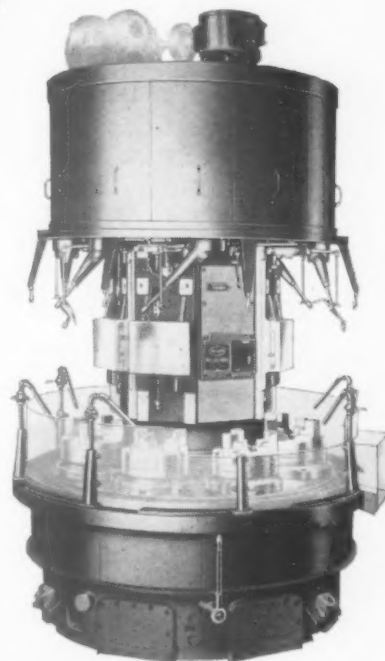
Mult-Au-Matics are considered now, more than ever before, as Key Units for repetitive machining of work where Accuracy and Fast Economical Production are the requirements.

Iron ore transported from the mines, and processed, provides the base material for iron castings, steel forgings and bar steel so essential to our Economic World of today.

From these forms thousands of different pieces of varying design are produced by industry on Machine Tools.

Mult-Au-Matic work is not confined to any one field of Industry but extends over a wide range of products.

The Automotive Industries have always been the largest users of these machines. However, the flexibility of tooling fits Mult-Au-Matics for practical use in the manufacture of fractional horsepower electric motors, tractors, mechanical farm equipment, power lawn mowers, outboard motors and nearly any class of work where boring, turning, facing, drilling and reaming operations are called for.



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*For manufacturing Economy use
Mult-Au-Matics. Built in
8-, 12-, 16-, and 34-inch sizes
with 4, 6, 8, 12, or 16 spindles
according to the specific model.*

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gleaned from
largest selection
of Swiss Preci-
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Tools in the U.S.

HIRSCHMANN HIGHLIGHTS

ABOUT PRECISION



MACHINE TOOLS

PUBLISHED BY CARL HIRSCHMANN COMPANY, MANHASSET • LOS ANGELES • MILWAUKEE — JUNE, 1952

NEW WESTERN BRANCH

Largest selection of modern high precision Swiss machine tools displayed on the West Coast is at 5124 Pacific Boulevard, Los Angeles, Western Branch of Carl Hirschmann Co., whose executive offices are at 30 Park Avenue, Manhasset, N.Y.

NEW MIDWEST BRANCH

Showrooms and warehouse for complete machines, spare parts and factory service for all lines exclusively represented in U.S. by Carl Hirschmann Co., is being developed at 525 E. Michigan Street, Milwaukee. Russell T. Gilman is Executive Director.

PRECISION BALL BEARING MANUFACTURING

Precision Ball Bearing Manufacturers have taken a decided interest in Tornos Automatics for bearing races manufacture. Tornos Machines, slower than multiples, have proven to make up lost time by reducing and eliminating secondary operations.

AIRCRAFT INSTRUMENTATION

Leading U.S. instrument makers use Hauser Burnishing Machines for much of their super finishing work on small parts. The new Hauser Super Finishing Method with especially developed ceramic wheels has found many suitable and cost-cutting applications in the instrument field.

SWISS MACHINES TO U.S. STANDARD

Hirschmann disregarding additional manufacturing costs, is striving more and more to adapt Swiss machines to U.S. Standards. Most of their machines are not only built to such standards but also are equipped with U.S. fuse boxes, belts, switches and standard precision ball bearings.

AIR SHIPMENTS

In many emergency cases Hirschmann has made delivery of medium sized machine tools (2000 lbs) from Switzerland to Midwestern factories in 48 hours via transatlantic air freight service. Through special assistance by U.S. customs, air shipments are cleared with only a few hours delay in New York.

CAM AND TOOL SERVICE

Complete cam and tool service for Automatics is obtainable directly from Manhasset. Factory trained Hirschmann specialists assure accurate and prompt service.

DIAMOND WHEELS

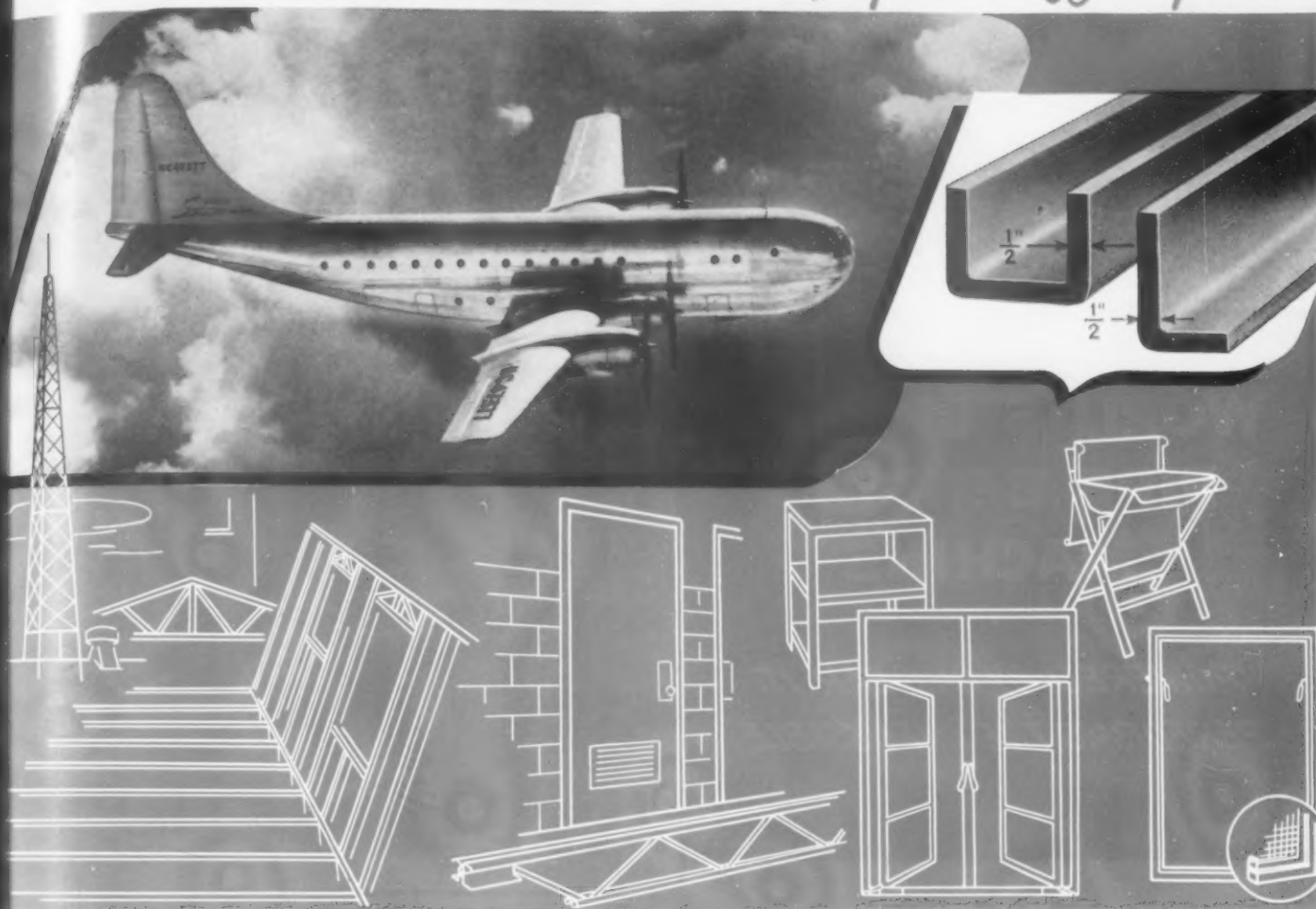
Hirschmann has secured considerable quantities of diamond wheels, which are adaptable for most standard machines. Prices are somewhat above domestic wheels due to the fact that in Switzerland the diamond market is still operating on free market.

SPARE PARTS

Carried in stock at 30 Park Avenue, Manhasset, N.Y., is most every spare part necessary for Hirschmann machines. Large quantities of collets and carbide tools of every bore and size also are standard stock items.

If you want the complete issue of HIRSCHMANN HIGHLIGHTS regularly, write Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y.

for Greater Strength and *Lighter Weight*



COLD-ROLL-FORMED *Structurals*

FROM COILED STRIP, you can cold-roll-form plain angles, channels and Z's up to $\frac{1}{2}$ " thick. Or you can design shapes to fit your own special needs, at a great gain in strength, or saving in weight, or both. This saving often amounts to more than the entire conversion cost.

Illustrating the high strength-weight ratio of roll formed shapes is their universal use in airplane construction. A few other applications are steel towers for various purposes; framing members for light buildings; partition studs and joists; window frames and sash; doors and trim; metal furniture and fixtures, etc.

Output of a Yoder Cold Roll Forming Machine, with one operator and a helper, is normally at the rate of 4000 to 6000 feet per hour, making the conversion cost a small fraction of a cent per foot. The machine, therefore, may be profitable even if operated only a few days per month. Other operations such as coiling, curving, notching, etc., can be combined with roll forming.

Tell us about your needs in light structurals and we shall be glad to submit recommendations and estimates, without cost or obligation. Illustrated Hand Book on Cold Roll Forming on request.

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Complete Production Lines

COLD-ROLL-FORMING and auxiliary machinery

GANG SLITTING LINES for Coils and Sheets

PIPE and TUBE MILLS—cold forming and welding





WORLD'S BIGGEST PIPE BENDING MACHINE

*POWERED BY OILGEAR, IT
PERFORMS THE "IMPOSSIBLE"*

Prior to the advent of the machine pictured above it was just not possible to bend a pipe over 30 inches in diameter without its buckling and distortion beyond the point of usefulness.

Yet the big "cat" crackers that have come up during and since the war made imperative the use of pipe three, four and five feet in diameter . . . and of course *bends* in such pipe. Bends bigger than the 30-inch diameter had to be fabricated of angular welded sections.

So slow and costly was this process, so troublesome the results in the field that The M. W. Kellogg Company engineers set themselves the task of solving the problem of bending big diameter pipe; and they called in Oilgear to help. The result of long endeavor was the world's biggest pipe bending machine turning out the world's biggest "bends". This machine is so successful that it has produced perfectly contoured bends for the largest catalyst carrier lines ever fabricated. Since its first day, it has saved time, money, labor . . . in the set-up, in the bending operations, in the greatly improved performance of such pipe in the field.

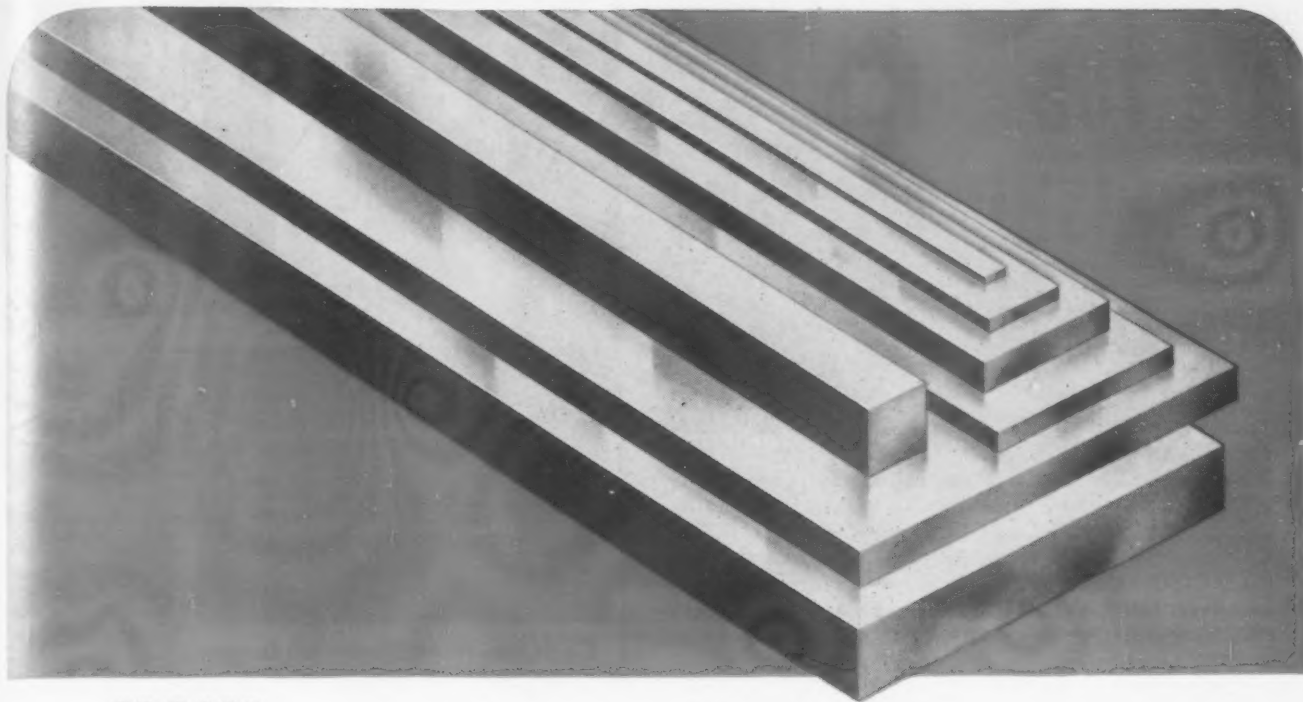
Here is just one of hundreds of machine and process problems "impossible" of solution to begin with, but

Oilgear DP-1225 Pump and two 71 x 156" stroke Cylinders

used on "world's largest" pipe bending machine designed and built by The M. W. Kellogg Co. engineers. Pump stroke, hence speed of bending operation, regulated to an infinite degree.

solved either directly or indirectly through the application of Oilgear engineering and Oilgear equipment. Why don't you find out what Oilgear can do for you? Many different functions are available. Savings in time and money and labor plus improvements in quality are the result. The Oilgear Company, 1573 West Pierce Street, Milwaukee 4, Wisconsin.

Oilgear



NOW... in addition to Oil-Hardening...

You can also get this

NEW AIR-HARDENING

SIMONDS *FLAT GROUND* DIE STEEL

For longer-lived punches and dies... where greater production runs are needed between sharpenings... you can now get this new *Air-Hardening* type of Simonds Ground Die Steel, which produces up to 50% more pieces per sharpening.

5% chrome content makes this Air-Hardening Steel more wear-resistant and therefore better suited for punches and dies used on silicon or stainless steels, Monel, or other abrasive metals, and for gages and tools requiring top wear-resistance. What's more, this new *non-deforming* die steel is spheroidize-annealed for good machinability and consistently uniform hardenability. Wide hardening range of 1700 to 1800° F. makes it practically foolproof in heat-treating.

Furnished in many stock sizes in 36" lengths, all sizes are accurately ground to a thickness limit of plus or minus .001" with an extra-smooth surface finish of 25 to 35 micro-inches. Each piece is individually packaged, ready for scribing, shaping and heat-treating. See your Industrial Supply Distributor today.



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The Tool Engineer

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Offering many other advantages for fast, clean polishing, ALUNDUM abrasive grain is available in sizes and with surface treatments for best results on every polishing job. Write for Booklet No. 1340, "Setting Up Polishing Wheels And Belts," containing many helpful tips. Norton Company, Worcester 6, Mass. Distributors in all principal cities.



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7/16" x 1 1/2" shank \$27.55 postpaid



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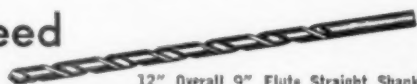
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13/64	1.80	15/16	2.25
7/32	1.80	21/64	2.50
		11/32	2.50
		23/64	2.75
		3/8	\$2.75
		25/64	3.05
		13/32	3.05
		27/64	3.30
		7/16	3.30
		29/64	3.60
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1 to 60 S.S. 4" to 6" long H.S. Drills

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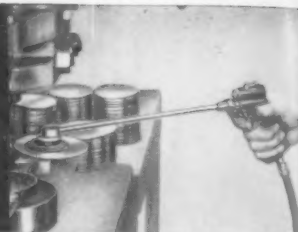
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Operated by
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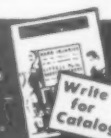
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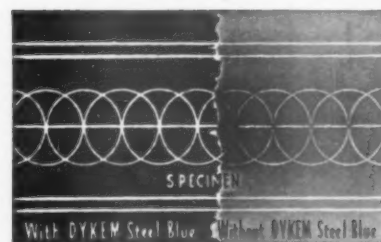
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& templates**

Simply brush on right
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ground broach look like this, when
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*Get this
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Minute jagged edges are characteristic
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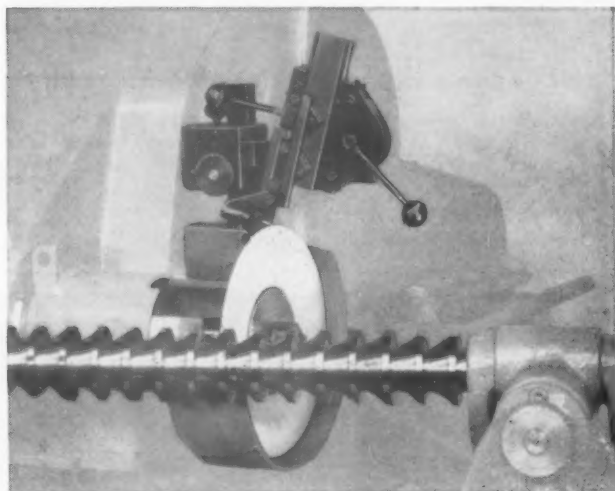
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DYMON-IZE* units are also available for use on your
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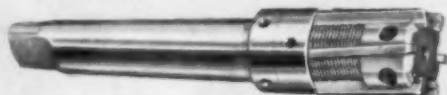
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You replace only the blades in WAUKESHA Inserted Blade Tools. The tool body lasts for years; a great economy compared with solid reamers which must be completely discarded when the blades wear undersize. — WAUKESHA blades are *adjustable* so you maintain accurate diameters through grind after grind . . . Blades are made of the finest high speed tool steel — carbide tipped if you so specify.

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WE REGRIND: MIDGET MILLS, COUNTER SINKS, END MILLS, MILLING CUTTERS, PINKING CUTTERS ETC. START USING THIS MONEY SAVING SERVICE NOW!

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+ Low Cost:

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GEAR HOBBER NO. 79

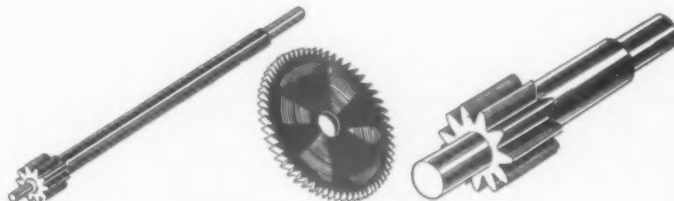
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• MIKRON No. 79 is an excellent choice for small spur gears and pinions. It is simple to operate, to set-up and to change-over from job to job. CAPACITY: Gears, max. dia. $1\frac{9}{16}$ "; max. length of cut $1\frac{1}{8}$ "; number of teeth 6 to 390; pitch DP 26 and finer.

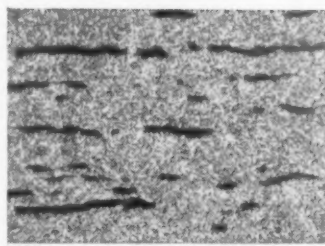


TODAY'S BIG NEWS IN GAGES:

1. User reports show Graph-Mo® steel outwears other tool steels 3 to 1!

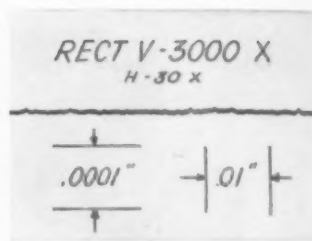
Gages made of Graph-Mo® steel are giving industry a great new standard of gage performance—with longer wear and greater stability than has ever been possible with gages made of any other tool steel! Proof of Graph-Mo's outstanding wearability: Reports from dozens of manufacturers who have switched to gages made of Graph-Mo steel show that Graph-Mo outwears other tool steels an average of 3 to 1!

Graph-Mo wears better because it contains free graphite and diamond-hard carbides. This structure gives excellent resistance to abrasion and has minimum tendency to pick up or gall. Tests on Amsler Wear Machine prove Graph-Mo has twice the resistance to galling when compared with conventional gage steels.



100X

PHOTOMICROGRAPH of Graph-Mo steel shows particles of free graphite and diamond-hard carbides which account for Graph-Mo's outstanding resistance to wear, pick up, scuffing and galling.



SMOOTH SURFACE FINISH—which also results in greater wear-resistance—is easier to get with Graph-Mo steel because of its excellent machinability. Above: Profilograph trace of Graph-Mo finish.

2. Tests on Graph-Mo steel master gage show only 10 millionths change in 12 years!

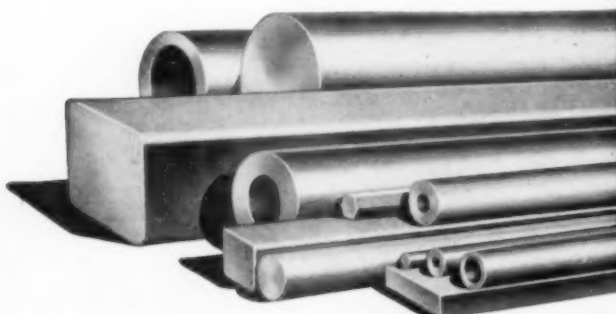
Gages made of Graph-Mo steel not only outwear others, they're more *stable* too! Using Johansson gage blocks, Zeiss optimizer, Sheffield optical comparator, and Graham-Mintel electronic comparator, the Timken Company measured a typical master plug gage at intervals and after a twelve-year period—found only ten millionths of an inch change. These gage measurements tell the story:

1940—1.73996	1944—1.73996
1941—1.73995	1945—1.73995
1942—1.73998	1948—1.73997
1943—1.73997	1951—1.73995

You can always tell Graph-Mo by its "graphitic look"—the tiny, scattered, parallel marks barely visible on the surface of a piece of polished Graph-Mo. This built-in "trade-mark", the result of free graphite in its structure, can't be duplicated in other steels. Look for it, insist upon it, next time you buy gages.

For further information on Graph-Mo's advantages to gage users and gage makers, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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TIMKEN
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SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

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Hartford Special

..... for **AUTOMATIC
DRILLING
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MACHINES**

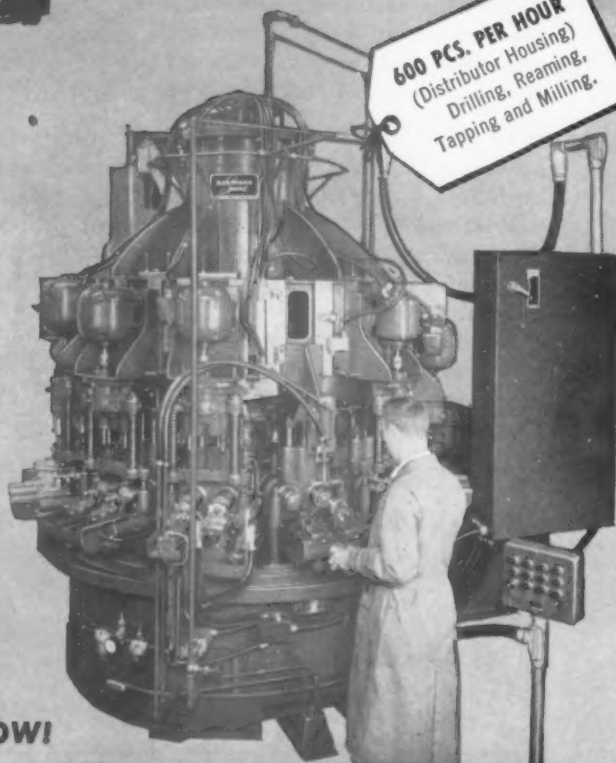
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Rough & Finished
Reaming. 10 Operations.



360 PCS. PER HOUR
(Piston)
Rough and Finished
Milling, Drilling &
Reaming. 5 Operations.

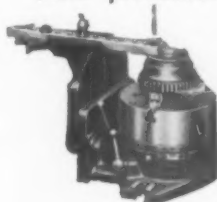


600 PCS. PER HOUR
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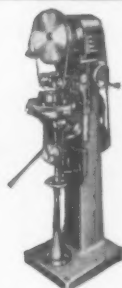
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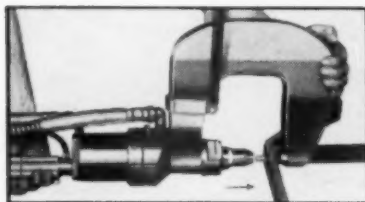
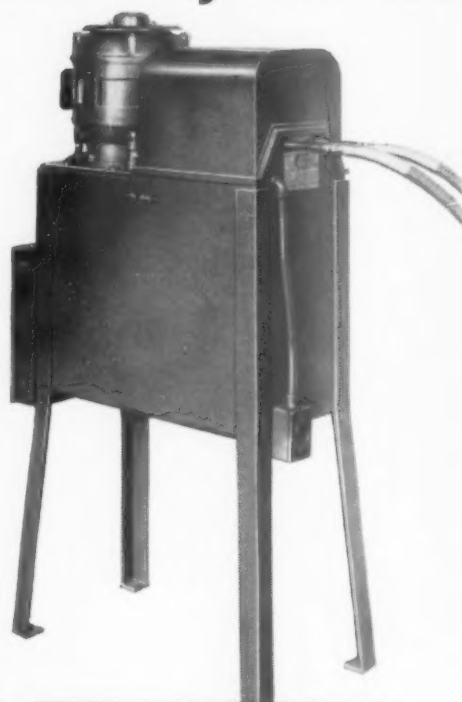
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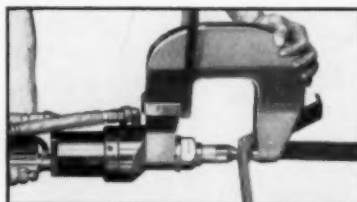
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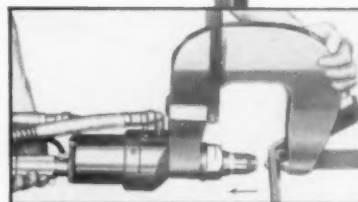
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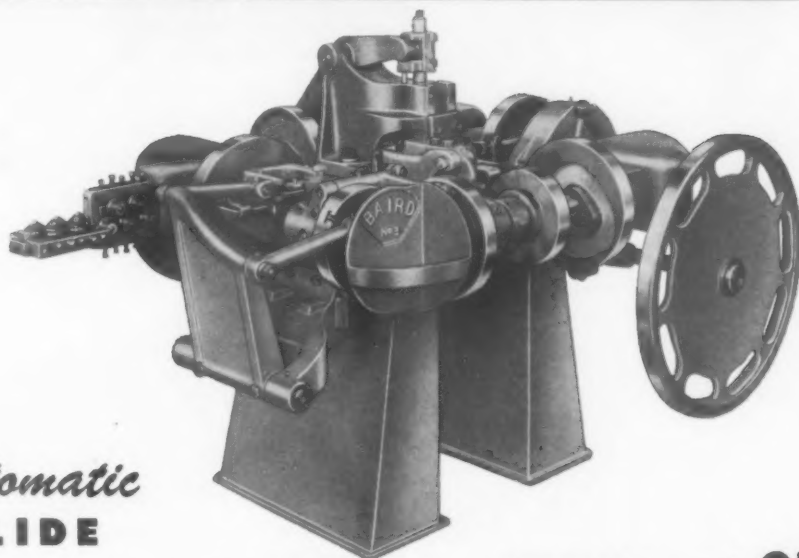
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1

Horizontal Press Attachments



2

Form Raising Attachment



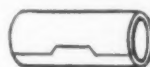
3

Pin Pulling Attachment



4

Setting Attachment



5

Secondary Cut-Off Attachment



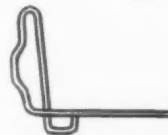
6

Nail Point (Vertical Cut-Off) Attachment



7

Vertical Forming Attachment



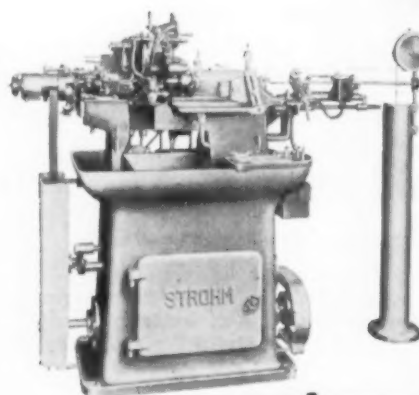
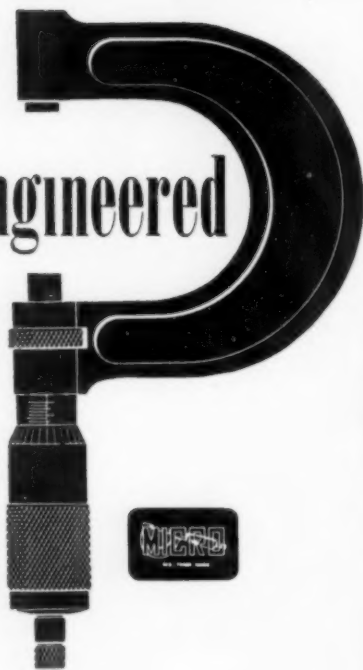
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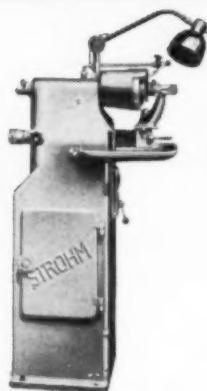
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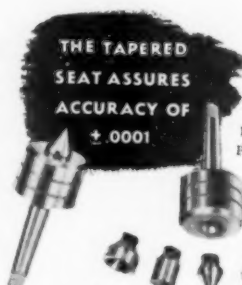
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many other applications at a small fraction of the cost of imperfect
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which is furnished with the Sleeve. The Sleeve can be sweated or
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Literature*

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The Tool Engineer

June, 1952

First & Finest!

Jones & Lamson Radial Chaser Die Heads

with **GROUND
THREAD
CHASERS**

These Die Heads will do an outstanding job on large or small lots, in pitches ranging from extremely fine to coarse multiple Acme.

They are versatile tools with an over-all capacity of from No. 8 to 4 $\frac{1}{4}$ ".

They require no more than the proper chasers to cut either right- or left-hand threads. No extra equipment is needed.

They are easy to install and simple to handle. For almost half a century J&L Dies and Chasers have been the answer to a multitude of threading jobs throughout the world.



Look at these features that make them leaders in their field and give you better threads at lower cost:

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Every part is of solid steel, hardened and precision ground. There are no built-up sections. Dependability and ultimate capacity are assured.

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All models are built with both concentric and longitudinal float.

DUAL-DIAMETER CONTROL LEVER FOR ROUGHING AND FINISHING CUTS

Heavy rough cuts, followed by light, accurate finish cuts can be taken with the same set of chasers by merely moving the roughing attachment lever. This is often a chaser saver on heavy, coarse pitch jobs, especially where short chamfers are a requirement.

SIZE ADJUSTMENT

The external micrometer adjusting screw provides simple and precise setting to exact pitch diameter. It is easy to set and maintain sizes well within your thread tolerances.

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Chasers are removed for resharpening, or size replacement, by merely removing the front cover of the Die. No tools are required. Change-over is a matter of seconds — which means more hours available for production.

Write to Dept. 710 for illustrated catalog and complete information on these and Tangent Chaser Types and Dies for Brown & Sharpe machines.

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*Machine Tool Craftsmen
Since 1835*

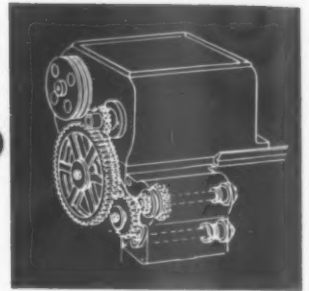
JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A.

DIE HEAD DIVISION

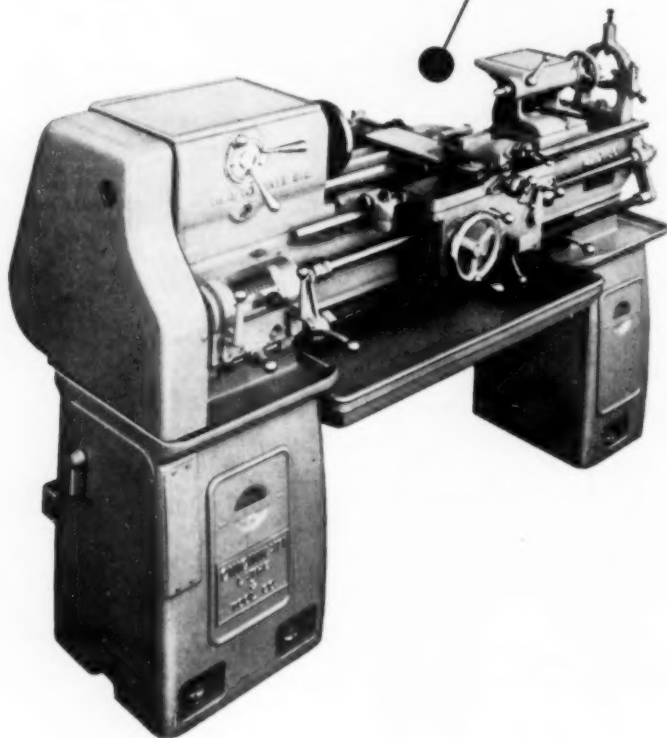
quick change artist

Reposition just
3 parts

Set up only two
additional gears



***from English to metric thread-chasing* in about
ten minutes***



Simple straightforward steps arrange your Tray-Top light duty engine lathe to cut a full range of 48 metric threads and carriage feeds through the standard quick change box . . . quicker by far than for any other lathe, and more economical, too . . . What's more, you can change any of 12 spindle speeds (all geared, 40 to 1 overall ratio) in an instant, with 3-lever direct-reading color-match speed selector . . . And you can change setups because parking spaces on top of headstock and tailstock put mikes, tools, etc., at operator's fingertips, right where needed.

Your Tray-Tops are indeed quick change artists. Operators spend no time figuring, more time getting work out. Make your next light duty lathe a Tray-Top.

****required for many defense items.***



OF OUTSTANDING VALUE

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cincinnati lathe & tool co.

Increase

PROFILE GRINDING PRODUCTION
50% to 75%

with

HECOMATIC

INFEED AND CHUCKING ATTACHMENTS



Illustration shows
HECOMATIC at work on 20 mm. projectiles

HECOMATIC

ENGINEERING SERVICE

Heco Engineering Department will be pleased to receive your inquiries regarding the Hecomatic method as applied to your profile grinding job.

HECOMATIC is the answer to the problem of automatically feeding, chucking and ejecting profile work on centerless grinders—with greater speed and accuracy

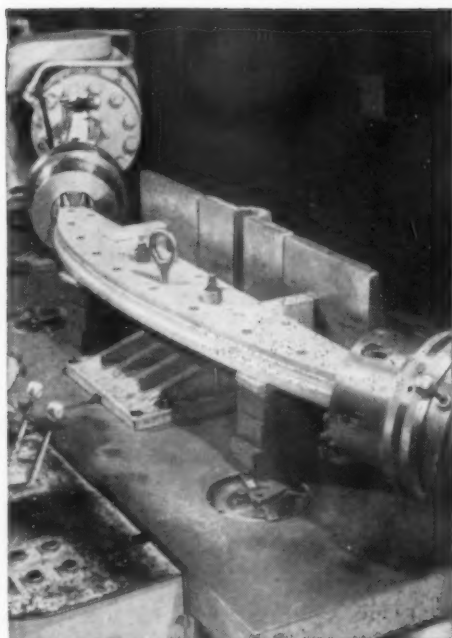
It proved itself during World War II in munitions plants in the United States, Canada, England and Australia, and is again being made available to the metal working trade and ordnance contractors.

HECOMATIC consists of three light weight units—the magazine, power unit and electric solenoid ejector. Completely automatic, it accomplishes *all* the operations man would do in *hand feeding, grinding and ejecting*.

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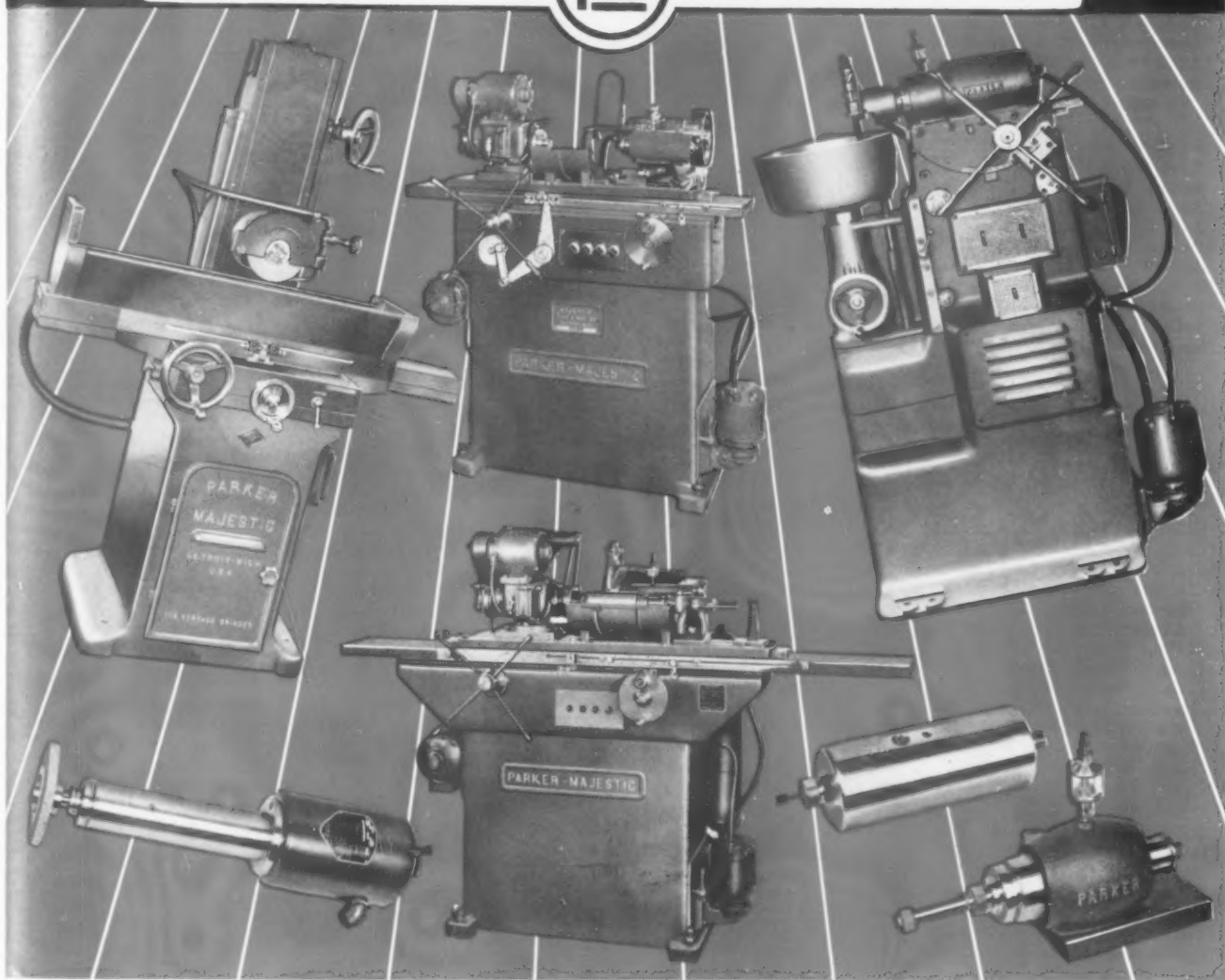
TOOL AND JIG PLATE



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PRECISION MACHINES



Above is pictured the home and products of the
PARKER-MAJESTIC, INC.

For almost a quarter of a century this company has manufactured the Parker Spindles used in Precision Grinding, Boring and Milling applica-

tions. Additional products include the well known line of Parker-Majestic Internal, External, No. 2 Surface and Rotary Surface Grinders.

Descriptive literature upon request.

PARKER-MAJESTIC, INC.

formerly **MAJESTIC TOOL & MFG. CO.**

147 JOSE. CAMPAU

• DETROIT 7, MICHIGAN

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June, 1952

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THE TOOL ENGINEER REGIONAL ADVERTISING OFFICES

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Austin G. Cragg
400 Madison Ave.
Phone: Plaza 9-4018
New York 17, New York

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Berea, Ohio

CENTRAL

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Phone: University 4-7300
Detroit 21, Michigan

WESTERN

Stanley F. Girard
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Chicago 11, Illinois

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- Crankshafts of nickel-chrome Molybdenum steel with a 126,000 lb. tensile and 16% elongation.
- Extra long gibs for longer die life.
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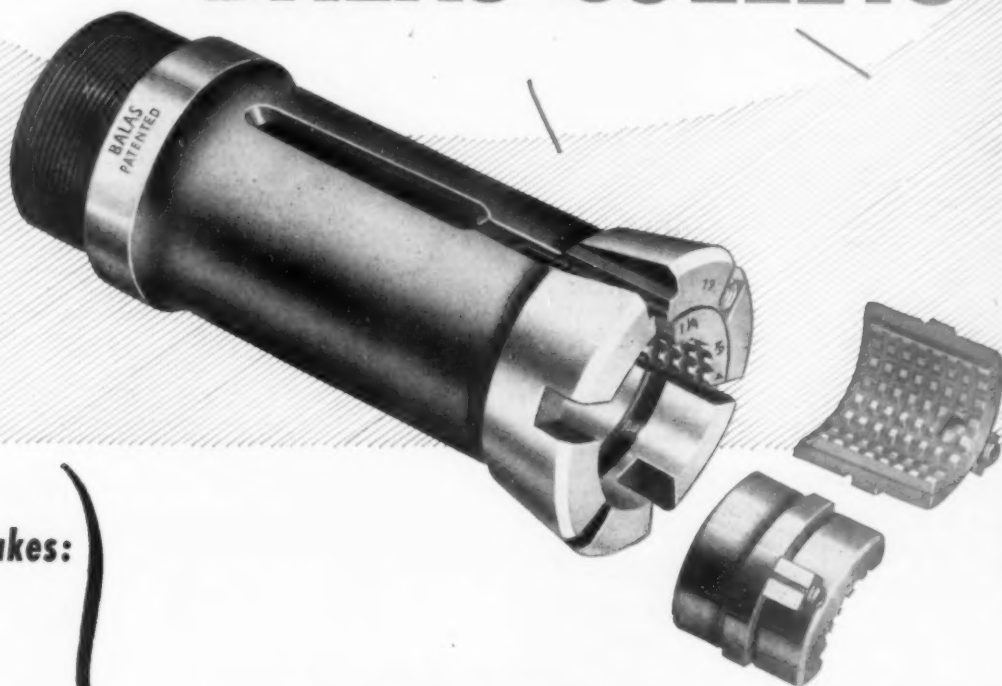
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Above: Counterboring a hole in a cast iron machine base. Uniformity of chips indicates free-cutting action; chip disposal is aided by wide flutes. And when the operation is finished the cutter is removed from the holder with a simple twist of the wrist.

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DETACHABLE
EVEN AFTER THE
TOUGHEST
CUTS**

**CONTINENTAL
STANDARD DRIVE
COUNTERBORES**



There's no wedging action in Continental Standard Drive Counterbores. Cutters are removable from the holder with a simple twist of the wrist, even after the toughest cuts. Double driving lugs on the cutters engage double abutments in the holders to give a balanced,

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CONTINENTAL TOOL WORKS

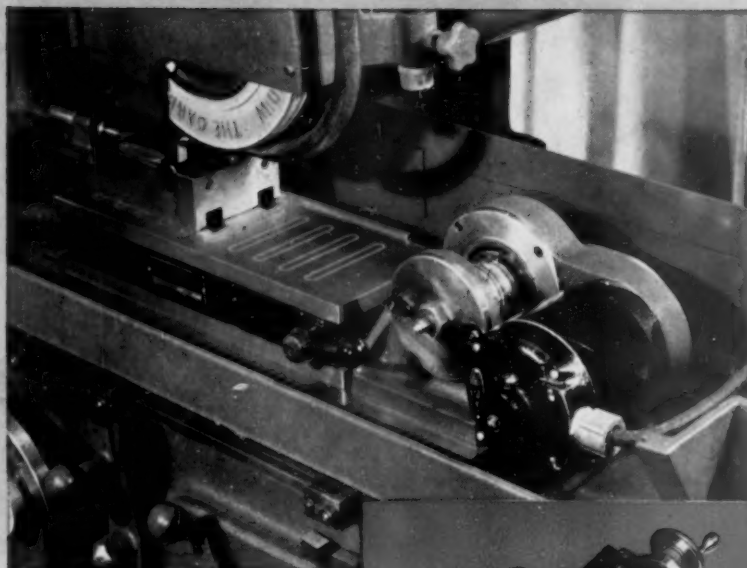
Division of Ex-Cell-O Corporation

DETROIT 32, MICHIGAN

Continental Counterbore Sets, available in your choice of three sizes, are fully described in Bulletin D27161. Send for your copy.



Equip for Crushtree Grinding Speed Production and Cut Cos



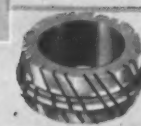
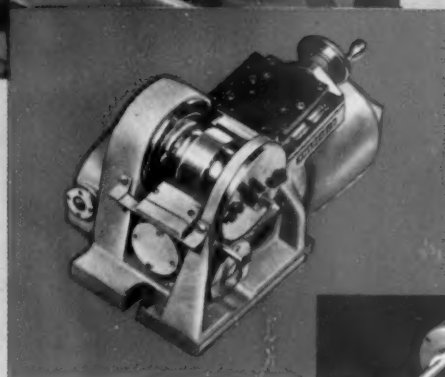
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Dressing the grinding wheel by Crushtree equipment (1) is very much faster than diamond dressing, (2) increases the cutting capacity of the wheel, (3) greatly reduces generated heat in grinding, (4) minimizes the tendency of the wheel to "load up" (5) reduces the actual grinding time as much as 75%.

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Write for information on the Sheffield "Crushtree Roll Bank" and specifications on these Crushtree Devices.



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Sheffield
corporation

Dayton 1, Ohio, U. S. A.

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